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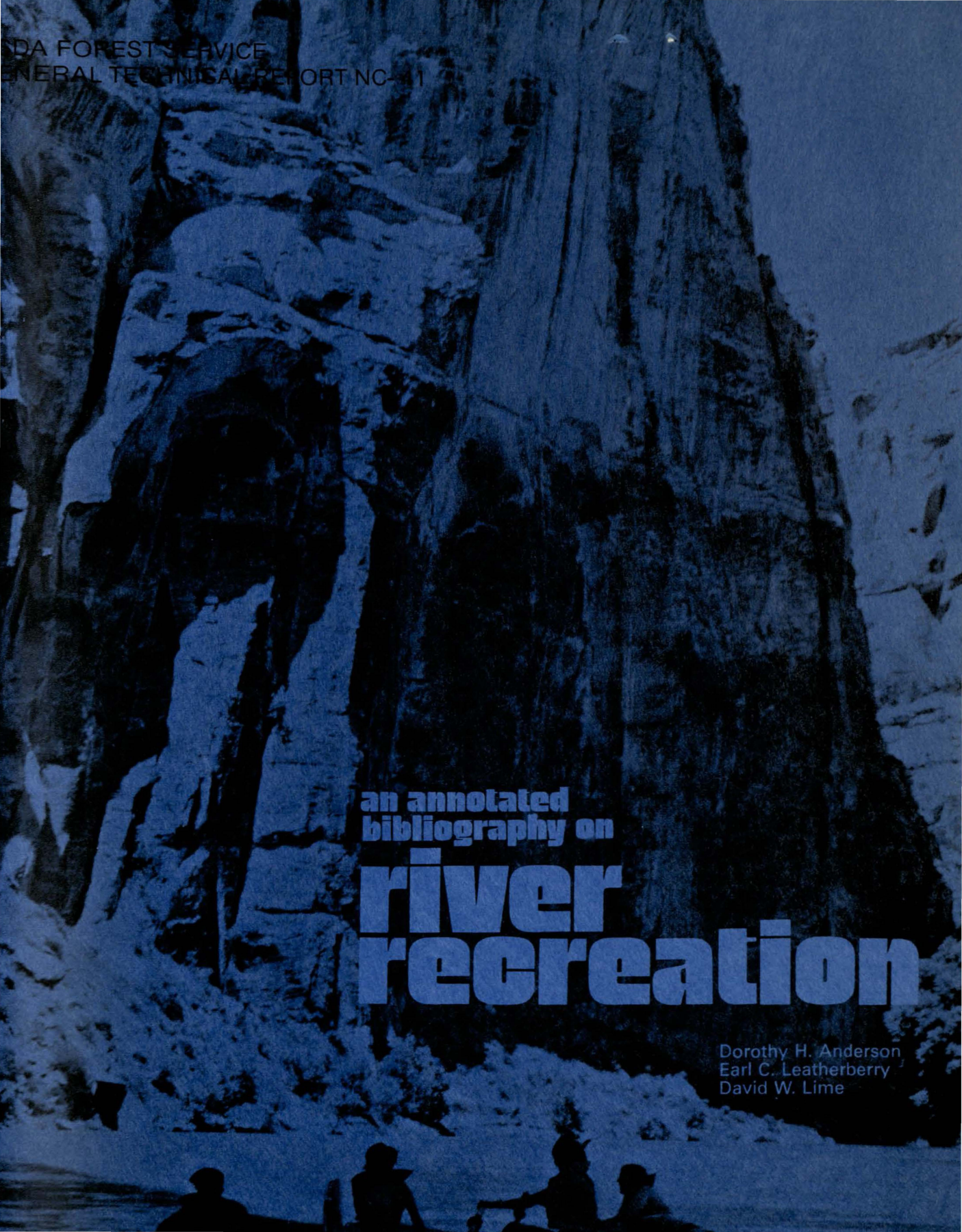

an annotated bibliography on river recreation

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AN ANNOTATED BIBLIOGRAPHY ON RIVER RECREATION

Compiled by

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During the past 10 years there has been a phenomenal growth in the number of people participating in water recreation activities in the United States. One of the most striking examples of this growth is on our Nation's rivers. For example, boating activities have increased 100 percent during the last decade on the Allagash River in Maine, the Pine River in Michigan, and the Rogue River in Oregon.

Along with the growth in the number of people using river recreation resources has come a growing interest on the part of administrators, planners, managers, researchers, and the public to learn more about these resources. Their interest is evidenced partly by the ever increasing volume of literature about river-based recreation. Concern and excitement about river recreational resources is evidenced further by the response at a recent international symposium on river recreation.

The Symposium, River Recreation Management and Research, sponsored by the North Central Forest Experiment Station's Backcountry River Recreation Management Research Project, was held in Minneapolis, Minnesota, January 24-27, 1977. About 400 participants representing 44 States and 5 Canadian Provinces attended the meeting. A significant product of this conference is a published proceedings[1] containing 55 formal papers on various aspects of river recreation. All of these papers have been cited and annotated in this bibliography.

Most of the literature about river recreation has been published since 1968. Also, much of the literature can be characterized as: (1) involving one-time studies without followup research to identify trends; (2) consisting of one-river case studies not comparable with other river studies; (3) emphasizing descriptive rather than process-causal analysis of river problems; (4) focusing on Western whitewater rivers unique in both location and management; and (5) concentrating on a single on-river activity during a specific time of the year.

An important criterion used to determine whether or not a publication was included in the bibliography was its availability. Most materials are available in depository libraries or can be obtained from the authors. A few reports, such as doctoral dissertations and some Water Resources Institute publications, may be difficult to obtain but are included because of the knowledge they contribute to understanding various aspects of the river recreation resource.

The Bibliography references materials were collected through December 14, 1977.

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[1] USDA Forest Service. 1977. River recreation management and research. USDA For. Serv. Gen. Tech. Rep. NC-28, 455 p., illus. North Central For. Exp. Stn., St. Paul, MN.

The bibliography is organized into nine parts. Within each one papers are arranged alphabetically by author. Many of the references are cited in more than one part. Therefore, all references are numbered. If a reference is relevant to more than one section, it appears with its annotation in the first appropriate one and is referenced by number only at the beginning of all other relevant sections. As an aid to locating references, an author index is provided at the end of the bibliography.

Part one lists several annotated bibliographies covering topics such as carrying capacity, landscape aesthetics, fishing, and the socio-economic aspects of water resources relevant to management and research of water-based recreation.

Part two includes references that provide a broad overview of the role rivers play in outdoor recreation. Articles describe the diversity of river recreation opportunities, document the need for research, recount attempts of State and Federal governments to preserve rivers through legislation, and report on problems encountered by recreation users, river managers, landowners, and others.

Methods to inventory and classify river recreation resources are presented in part three. River resources can be classified by any number of variables such as user landscape preferences, physical characteristics of the river environment, level of experience needed to float a river, and types of activities prevalent on a river or in the river corridor.

Part four cites economic methods to evaluate alternative uses of river resources. Articles cited examine the economic benefits the recreation user enjoys by supporting such programs as stocking rivers with game fish and the economic benefits realized by private entrepreneurs who provide recreation users with facilities such as campgrounds, boat docks, and places near the river for recreation equipment rentals. Benefits such as increased employment and commercial development local communities may receive as a result of preserving local rivers for recreation are discussed also.

Articles cited under part five describe investigations of the impacts that people or the recreation activity have on river resources such as the effects of trampling on streambank erosion and vegetation, the impacts of gasoline motors on water quality, and the consequences of littering to the aesthetics of the river environment.

Part six focuses on how rivers are used and by whom. Users have been identified by their socio-economic characteristics, preferences for specific kinds of recreational activities or settings, motivations for engaging in water recreation pursuits, and behavior they exhibit while recreating on and along rivers.

Techniques such as site management, rationing, zoning, and site maintenance and rehabilitation to manage both the user and the river resource to meet desired management objectives are cited in part seven.

Part eight contains an unannotated chronological listing of all Federal legislation pertaining to the National Wild and Scenic Rivers Act of 1968.

An unannotated listing of selected guidebooks on rivers of North America is contained in part nine. All include descriptive information about rivers, which aids in defining the role of rivers as recreational resources.

ACKNOWLEDGMENT

We wish to express our appreciation to Lorinda Anderson, former student at the University of Minnesota; Alfred Buck, retired from the Bureau of Outdoor Recreation; Richard Hecock, Oklahoma State University; and, Clay E. Peters, Staff Consultant, Committee on Interior and Insular Affairs, U.S. House of Representatives for their assistance in the preparation of the Bibliography.

BIBLIOGRAPHIES PERTINENT TO WATER RESOURCE MANAGEMENT AND RESEARCH

1. Arthur, Louise M., and Ron S. Boster. 1976. Measuring scenic beauty: a selected annotated bibliography. USDA For. Serv. Gen. Tech. Rep. RM-25, 34 p. Rocky Mt. For. and Range Exp. Stn., Fort Collins, Colorado.

Contains 167 references, most of which date from 1965. Papers are categorized into: (1) literature review, (2) inventory methods, (3) public involvement, or (4) miscellaneous. Many annotations include a "critical comment".

2. Ditton, Robert B. 1969. The identification and critical analysis of selected literature dealing with the recreational aspects of water resources use, planning, and development. Res. Rep. 23, 293 p. Univ. Illinois. Water Resour. Cent., Urbana, Illinois.

Describes how more than 1,000 articles and publications were identified, documented, and classified according to keyword descriptors. A computerized bibliographic retrieval routine was developed to enable an investigator to receive relevant bibliographic notations. Using this retrieval system to assemble bibliographies by topic, this project surveyed and analyzed research findings and their implications for water recreation planning and development. An interdisciplinary water recreation planning and development bibliography is included.

3. Hamilton, H. R., D. H. Owens, J. E. Carroll, A. R. Glenn,and B. A. Gilmour. 1966. Bibliography on socio-economic aspects of water resources. 453 p. USDI Office of Water Resour. Res., Washington, D.C.

Contains 770 annotations of papers, most of which were published between 1955 and 1965. Includes literature in the following areas: (1) supply of and demand for water of various qualities including the competitive use for industry, domestic, and recreation; (2) method and application of cost/benefit analysis; (3) economic impact of water resource and water development projects; (4) methods of determining the economic value of sport fisheries, wildlife, and other aquatic outdoor recreation resources; and (5) social values of water-based outdoor recreation.

4. Potter, Dale R., Kathryn M. Sharpe, and John C. Hendee. 1973. Human behavior aspects of fish and wildlife conservation: an annotated bibliography. USDA For. Serv. Gen. Tech. Rep. PNW-4, 287 p. Pac. Northwest For. and Range Exp. Stn., Portland, Oregon.

Contains 995 references from 218 different sources on nonbiological or human behavior aspects of fish and wildlife conservation. Includes papers on sportsman characteristics, safety, law enforcement, professional and sportsman education, nonconsumptive uses, economics, and history. Also includes a categorized summary of reference sources.

5. Potter, Dale R., Kathryn M. Sharpe, John C. Hendee, and Roger N. Clark. 1972. Questionnaires for research: an annotated bibliography on design, construction, and use. USDA For. Serv. Res. Pap. PNW-140, 80 p. Pac. Northwest For. and Range Exp. Stn., Portland, Oregon.

Questionnaires as social science tools are used increasingly for studying the human aspects of outdoor recreation and other natural resource fields. An annotated bibliography including subjective evaluations of each article and a keyword list is presented for 193 references to aid researchers and managers in the design, construction, and use of mail questionnaires.

6. Stankey, George H., and David W. Lime. 1973. Recreational carrying capacity: an annotated bibliography. USDA For. Serv. Gen. Tech. Rep. INT-3, 45 p. Intermt. For. and Range Exp. Stn., Ogden, Utah.

Contains more than 200 references covering recreational carrying capacity problems. Contents are categorized into concept, biology, aesthetics, and management.

7. Alexander, Harold E. 1965. The state's role in stream preservation. Naturalist 16(3):26-29.

Suggests that stream preservation efforts are based on perpetuation of intangible values, both aesthetic and scenic, that contribute to the scope and quality of the human environment. Believes previously used criteria for assigning values to intangibles are inadequate because States continue to lose ground to development interests.

8. Alling, Curtis Edwin. 1977. An identification and analysis of the critical obstacles encountered in the creation of State natural rivers programs. M.S. thesis. Dep. of Recreation and Parks, Texas A&M Univ., College Station, Texas. 71 p.

Data collected from 40 States that have taken recent action to protect natural river systems was analyzed to identify and try to devise methods to overcome the obstacles encountered by State agencies as a result of their actions to establish natural river programs. Four principle obstacles were: (1) opposition of the local community, (2) lack of administrative support from higher levels of State government, (3) competition for the river corridor resources with other uses, and (4) lack of visible constituents to offer support. Methods are suggested to overcome these obstacles. Concludes that no one alternative is a solution for overcoming the obstacles, and that each area should be dealt with individually.

9. Alston, Farnum, and Bob Deer. 1975. The Wolf River--an uncertain future. Naturalist 26(1):13-15, 18.

Details the history of Menominee Indian's management practices and use of the Wolf River in northeastern Wisconsin. Discusses land tenure changes, State leasing of land for public access and use, and current conflicts over inclusion of Wolf River in the National Wild and Scenic River System.

10. Bock, William, and Frank Thomas. 1974. A look at the Wild and Scenic Rivers Act. Tech. Assist. Pap. Ser. B, Pap. 1, 18 p. USDI Bur. Outdoor Recreation.

A quick reference guide consisting of two parts: (1) self-explanatory outline of the Act, and (2) legal opinions that answer frequently asked questions about the interpretation of the various sections and phrases of the Act.

11. Brittain, Robert. 1958. Rivers and man. 288 p. Longsman, Green & Co., London.

Develops the idea that rivers are intimately involved in every stage of human development. Traces the stages of man's mastery over rivers and the resultant changes in human society. Relates ancient uses of rivers that contributed to man's progress: fishing, agriculture, urban water systems, trade, and water power.

12. Brockman, Frank C. 1961. Recreation and water in the west. *In* Water Resources papers 1960: water-measuring and meeting future requirements. Harold L. Amos, ed. Univ. Colorado, Boulder, Colorado.

Outlines the history of increasing interest in public recreation lands in the United States. Notes that conflicts in priorities arise, especially in the western States, between recreation and consumptive uses. Stresses the need for recreation planning that will balance such conflicts and will maximize inherent benefits of wildlands. Cites current research that will facilitate such planning: ecological studies, carrying capacity research, and human behavior studies.

13. Brown, Perry J. 1977. Information needs for river recreation planning and management. *In* River recreation management and research Symp. Proc., January 24-27, 1977. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 193-201. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Information inputs to making decisions about recreational use of rivers are described. Major recreational decisions and possible inputs to them are identified. A future scenario for recreational use of rivers is given and the needed research on information inputs is identified within the context of the scenario.

14. Bryan, Robert L. 1977. Canoeing use of Huron-Clinton Metropark. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 121-124. North Cent. For. Exp. Stn., St. Paul, Minnesota.

An urban regional Metropark system (Detroit area) continues to encourage use by canoeists of the Huron and Clinton Rivers. Unrestricted canoeing use has been encouraged by river inventory, maps, clean-up, and canoe rental concessions and facilities. Author suggests a need for different standards for urban rivers than for wild rivers. Believes these standards should include landscaped urban scenes and manufacturing sites as well as natural scenery. And, canoeing use should be unrestricted to alleviate social pressures of urban residents.

15. Cheffins, William F. 1977. New initiatives in heritage preservation: the agreements for recreation and conservation program of Parks Canada. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 232-235. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Parks, Canada, has created a new Program--Agreements for Recreation and Conservation (ARC) to ensure the preservation of a broad range of human and natural heritage resources and to meet the changing leisure-time needs of Canadians. Describes the ARC Program and its charter to identify, plan, preserve, develop, and manage historic waterways, historic land trails, wild rivers, and heritage areas.

16. Countess, Michael L., Walter L. Criley, and B. R. Allison. 1977. Problems and conflicts associated with river recreation programming and management in the East. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 147-150. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Increased river recreation has resulted in conflicts between landowners and users about project development. The authors suggest that controversies typically are due to different attitudes, values, and philosophies, and the failure of the managing agencies to incorporate such considerations in river programs. Most problems and conflicts are symptoms of an uninformed public.

17. Cowgill, Peter. 1971. Too many people on the Colorado River. Natl. Parks Conserv. Mag. 45(11):10-14.

Cites problems of increasing use on the Colorado River through Grand Canyon National Park, Arizona. Problems resulting from the disposal of waste are most acute. Current park management guidelines seek to control the number of users and to protect the most fragile environments. Two issues remain undecided for this section of the Colorado River: wilderness designation and the use of outboard/inboard motors.

18. Craighead, Frank C., Jr. 1965. Semi-wild rivers--the Upper Snake, a river in transition. Naturalist 16(3):6-17.

Settlements and developments along the Snake River have harnessed large sections of the river for hydroelectric energy. Impoundments and dykes have likewise altered its channel and stream flow. Rivers are dynamic and they often change in subtle ways, such as the type of recreation use and users and the man-made structures along rivers. Scientific, informed approaches are needed to classify, evaluate, and manage rivers. Outdoor recreation experiences are influenced by both the uniqueness of the water resource and the quality of recreational experiences. Steps to integrate river recreation management into public planning for an entire river basin are suggested.

19. Craighead, John J. 1965. Wild River. Naturalist 16(3):1-5.

Describes the experience of running a wild river and the fragility of the river resource. Suggests a classification system for types of recreation use of rivers. Urges national legislation to preserve wild rivers for the future.

20. Craighead, John J. 1966. Wild Rivers...in a national scenic rivers system. Naturalist 17(2):29-31.

Analyzes the effectiveness of a wild rivers bill proposed in the 1965 U.S. Senate. Notes lack of river classification system, specific administrative objectives, and methods for evaluating changes in use patterns and user impacts on rivers. Compares wilderness management legislation with proposed river legislation.

21. Curtis, Eric J. 1977. Some legal aspects of river recreation management in the East. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 8-18. North Cent. For. Exp. Stn., St. Paul, Minnesota.

The theme is the almost incredible multiplicity and the complex interrelation of overlapping governmental controls and private lawsuits affecting rivers and streams in the East. A basic formula or approach to help identify, understand, and distinguish these interwoven legal control mechanisms is presented. Certain basic principles, cases, and authorities are incorporated into fable form based upon Siegfried's Rhine Journey.

22. Eastman, Robert L. 1977. River preservation and recreation programs. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 178-182. North Cent. For. Exp. Stn., St. Paul, Minnesota.

The circumstances that led to the passing of the Wild and Scenic River Act in 1968 are reviewed. Also, the legislation that has been considered and passed with respect to adding rivers to the National Wild and Scenic Rivers System is discussed.

23. Elliott, Robert L. 1977. Commercial river outfitting: its educational role and responsibilities to the future. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 213-219. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Three trends are postulated: (1) a decrease in the rate of demand for commercial outfitting services, (2) an increase in demand for "do-it-yourself" trips, and (3) an increase in governmental regulations. The competition between commercial outfitters and private groups on restricted rivers is explored. Suggests that commercial outfitters can be justified for both their "educational" and "public access" services; the outfitter who so justifies his existance can enjoy a greater freedom from worry over future survival.

24. Ellis, Willis H. 1966. Watercourses-recreational uses for water under prior appropriation law. Nat. Resour. J. 6(2):181-185.

Reviews the 1965 court case, Colorado River Water Conservation District versus Rocky Mountain Power Company, in which the District sought to specify rates of flow necessary for fish life in order to prevent further water diversion by the Company. Colorado Supreme Court denied the District the water rights it claimed based on the decision that the State of Colorado has no legal authority to acquire water rights for fish propagation without making a diversion, such as a retaining pond, from the stream. This decision appears to conflict with a 1937 decision that empowered the District to hold sufficient water from natural streams to preserve fish for the benefit of the recreating public.

25. Fisher, Dorothy L. 1976. Congress debates a river's future: the Missouri River. Environmental Comment, June 1976, p. 4-5. (A publication of the Urban Land Institute)

Briefly describes efforts to designate a 170-mile stretch of the Missouri River in north-central Montana into the National Wild and Scenic Rivers Act. Also summarizes the findings of a study to determine suitability of the River for inclusion in the system.

26. Ford, Charles R. 1975. Effect of new legislation on management of river systems. 40th North Am. Wildl. Nat. Resour. Conf. Trans. 40:273-280.

Several recent laws--the Water Resources Development Act of 1974, the Flood Disaster Protection Act of 1973, the Disaster Relief Act Amendments of 1974, the Housing and Community Development Act of 1974, and the Federal Water Pollution Control Act Amendments of 1972--will have a major impact on river management. These laws give the Federal agencies, that are responsible for water resources planning new and improved authority for managing rivers with multiple purposes with multiple means. A brief summary of the parts of each act relevant to improving the management of river systems in urban areas is given. Opportunities for improving the urban environment, preserving green space and wetlands, and conserving and enhancing wildlife are also summarized.

27. Gunn, Clare A. 1977. Urban rivers as recreation resources. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 19-26. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Cites examples of current recreational developments of urban waterways: San Antonio River Walk, Wichita River Parkway, Trent-Severn-Rideau Waterway (Ontario), and New York State Canal Recreation Development Program. Documents benefits: protection of natural amenities, revitalization of downtown, provision of leisure activity, and increases in jobs, incomes, and taxes generated through commercial enterprises related to development.

28. Haack, Lawrence E. 1975. Rivers of the Hiawatha. Naturalist 26(1):24-27.

Describes recreation opportunities on rivers in the Hiawatha National Forest of the Upper Peninsula of Michigan and gives a brief history of land use. Notes Forest Service multiple use management techniques employed in three use zones of the Forest: general forest, travel influence, and water influence.

29. Hammon, Gordon A., Harold K. Cordell, Lewis W. Moncrief, M. Roger Warren, Richard A. Crysdale, and John Graham. 1974. Capacity of water-based recreation systems part I: the state of the art--a literature review. Water Resour. Res. Inst. Rep. 90, 49 p. North Carolina State Univ., Raleigh, North Carolina.

Examines the problem of identifying the optimal use-level of recreation for a given water body. Recognizes the complex and dynamic concept of carrying capacity and reviews literature that relates to factors influencing capacity. Discusses applicability of Liebig's law of the minimum to carrying capacity. Reviews empirical research related to capacity conceptualization and measurement. Stresses the need for theoretical models for measuring capacity.

30. Hecock, Richard D. 1977. Recreational usage and users of rivers. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 279-284. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Describes trends in the recreational use of rivers by studying participation data and usage information. Identifies patterns of socio-economic and experiential characteristics of users. Evaluates existing data and assesses data needs on river recreation use and users.

31. Herbst, John R., and Edgar L. Michalson, eds. 1969. A wild and scenic rivers symposium. July 25-27, 1969. 49 p. Water Resour. Res. Inst., Univ. Idaho, Moscow, Idaho.

Directs the Idaho Water Resources Institute to develop criteria for evaluating proposed rivers for inclusion in the National system. Identifies three major research areas for wild and scenic rivers studies: (1) importance of aesthetics in river evaluation; (2) development of quantitative methods to measure economic benefits and trade-offs gained from wild or scenic river status; and, (3) alternative methods of river evaluation.

32. Huser, Verne. 1977. Industry responds to the explosion in river recreation. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 38-44. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Describes the response of private enterprise to the growing interest in river recreation--(1) increase in the number of outfitters, (2) increase in watercraft and gear production, (3) increase in the literature about the sport, and (4) increase in number of services that are provided the river-using public.

33. Ingram, Helen. 1971. Patterns of politics in water resources development. Nat. Resour. J. 11(1):102-118.

Water policy is currently undergoing a rash of criticism. Water development has a strong impact on society and on plants and wildlife, yet little attempt has been made in water policy to fulfill social or environmental goals--primarily because the pattern of politics in water is politically rational. To effectively alter water policy, the long-held view that water is a *local* resource must be changed to reflect its regional and national importance. This change can be brought about through political leadership and education.

34. Iseri, Kathleen T., and W. B. Langbein. 1974. Large rivers of the United States. USDI Geol. Surv. Circ. 686, 10 p. Washington, D.C.

Presents information on the flow of the 28 largest rivers in the United States based on averages during the periods 1931-1960 and 1941-1970. Rivers are classified with respect to their flows as measured by volume of discharge. River lengths and drainage areas provide a subsidiary classification system. Human activity as well as topography, geology, climate, and vegetation greatly affect streamflows and the character of rivers.

35. Lewis, Darrell E., and Gary G. Marsh. 1977. Problems resulting from the increased recreational use of rivers in the West. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 27-31. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Discusses impacts and conflicts created by increasing recreational use of rivers in the western United States. Problems addressed include environmental, social, and administrative interrelations on rivers.

36. Lime, David W. 1975. Backcountry river recreation: problems and research opportunities. Naturalist 26(1):2-6, 16-17.

Identifies increasing use of backcountry rivers and the associated social and environmental problems. Urges sociological research on three topics: (1) how patterns of river use and characteristics of users vary within and between rivers; (2) how current and potential users define a high-quality river recreation experience; and (3) kinds of management techniques needed to increase user enjoyment and decrease resource damage.

37. Lime, David W. 1977. Research for river recreation planning and management. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 202-209. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Three research problem-areas emphasizing social or people problems on rivers are described: (1) how patterns of river recreation use and characteristics of users vary on individual rivers, between different rivers, and with time; (2) how current and potential users define quality river recreation experiences; and (3) how patterns of river recreation use can be modified.

38. Litton, R. Burton, Jr., Robert J. Tetlow, Jens Sorensen, and Russell A. Beatty. 1974. Water and landscape: an aesthetic overview of the role of water in the landscape. 314 p. Water Inf. Cent. Inc., Port Washington, New York.

Discusses the aesthetic role of water on landscape. Proposes a visual classification system for fresh water resources based on landscape, setting, and waterscape. Cites criteria for natural and man-made landscape evaluation. Recommends intra-agency adoption of aesthetic evaluation policies for water so that water-oriented landscapes may be defined and evaluated using aesthetic criteria as major tools. Encourages research that incorporates aesthetic evaluation with benefit cost analysis.

39. Mann, R. 1973. Rivers in the city. 256 p. Praeger Publishers, New York, New York.

Discusses historical, economic, sociological, and aesthetic problems of urban river management and the important aspects of progress in the conservation of river landscapes. Tells how 15 major urban communities have utilized their river landscapes to provide recreational facilities.

40. McCool, Stephen F., L. E. Royer, J. J. Kennedy, and J. D. Hunt. 1974. Recreational use and management problems on Utah's wild rivers. Utah Acad. Sci. Arts Lett. Proc. 51(1):109-115. Utah State Univ., Logan, Utah.

Discusses management problems on wild rivers in the Intermountain West: increased visitor use on flora and fauna native to riverine environments; human waste disposal; motivations of visitors; and opportunities for visitor solitude. Suggests that a carrying capacity-based recreation management system could solve these problems.

41. Michalson, Edgar L. 1975. Part C: wild and scenic rivers. *In* Regional problem analysis in the Pacific Northwest. p. 87-122. Wash. State Univ., Pullman, Washington.

Stresses the need for clarifying problems faced by multiple-agency management of rivers. Suggests that universities take an active role in river research and identifies four general areas needing investigation: (1) environmental problems; (2) carrying capacity (the establishment of limits, management, and the results of management); (3) commercial and non-commercial uses and demands; and (4) jurisdictional arrangement (functional, geographical, agency).

42. Moncrief, Lewis, and Jan Canup. 1974. Forgotten rivers. Parks and Recreation 9(10): 30-33, 68, 70, 72, 74.

The authors argue that the potential of urban rivers for recreational purposes has not been fully realized. Cites the importance of public opinion in urban river reclamation. Urges development of riparian corridors to take advantage of rejuvenated waters. Discusses efforts in Delaware and Texas to implement greenways along urban rivers.

43. Montana Dep. of Fish and Game. 1976. Montana Outdoors 8(2):1-45.

Special issue of the "Montana Outdoors" magazine that emphasizes the Yellowstone River. Articles feature: the role the River has played culturally for the past 200 years; public opinion on future water use; water requirements for industry, fish, wildlife, and recreation; and nine Yellowstone Basin research projects that document the effects of increased water withdrawals on recreation, fish, and wildlife.

44. Nash, Roderick. 1977. River recreation: history and future. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 2-7. North Cent. For. Exp. Stn., St. Paul, Minnesota.

The recent rise of interest in river recreation must be seen against a background of fear of wild rivers as part of the uncontrolled wilderness. Revolutions in ideas, equipment, and technique paved the way for the transformation of river running from a high-risk expedition to family fun. Suggests the future will see increasing competition for the recreational potential of rivers, particularly for float trips.

45. Outdoor Recreation Resources Review Commission. 1962. Sport fishing--today and tomorrow. ORRRC Study Rep. 7, 130 p. Gov. Print. Off., Washington, D.C.

Presents an appraisal of fishing as a form of recreation in the United States and includes a State-by-State survey of the problems of supply, status of fishing waters, and management policies and responsibilities. Covers present and future supply of both warm- and cold-water fish and projects the future of sport fishing by regions.

46. Outdoor Recreation Resources Review Commission. 1962. Water for recreation-values and opportunities. ORRRC Study Rep. 10, 130 p. USDI Geol. Surv., Washington, D.C.

Analyzes future economic demand for water-based recreation in the United States. States that recreationists and industry should compete equally for use of water. Relates factors of water quality and access problems to recreational use of water resources.

47. Painter, Bill. 1976. Understanding the Wild and Scenic Rivers Act. Environmental Comment, June 1976. p. 2-4. Urban Land Institute.

Briefly describes provisions in the National Wild and Scenic Rivers Act of 1968 to protect free-flowing rivers. Notes that the primary aim of the National Wild and Scenic Rivers System is to maintain the status quo along designated rivers.

48. Parry, B. Thomas, and Richard B. Norgaard. 1975. Wasting a river. Environmentalist 17(1):17-20, 25-27.

Criticizes the objectivity of the economic assessment made for the New Melones Dam on the Stanislaus River in California. Gives a brief legal history of the dam controversy. Compares and analyzes Army Corps of Engineers benefit cost estimates with authors' own estimates. Notes lack of quantification of adverse environmental impacts in Corps' analysis and concludes Corps' overestimated benefits and underestimated costs of the project.

49. Peters, Clay E. 1975. A national systems of wild and scenic rivers. Naturalist 26(1):28-31.

Briefly traces the history of the National Wild and Scenic Rivers Act of 1968: rationale for such a river system, processes that add new rivers to the federal system, types of river classification possible (wild, scenic, or recreational), and various management efforts to preserve rivers (zoning, conservation, scenic easements, etc.).

50. Pfister, Robert E. 1975. Protection of free flowing rivers. *In* Water Resources Policy Issues--1975. p. 63-72. Water Resour. Res. Inst., Oregon State Univ., Corvallis, Oregon.

Examines the federal legislative mandate to protect free-flowing rivers and notes challenges to be faced in implementing the policy. Identifies research needs for wild and scenic rivers such as the attitudes of public agency personnel, the impacts of use controls on river users experiences, and the methods to assess intangible benefits of river experiences.

51. Priesnitz, Michael. 1975. The rivers that run on borrowed time. Naturalist 26(1):7-12.

Reviews State of Minnesota river management and planning procedures, including the 1973 Minnesota Wild and Scenic Rivers Act that was aimed at preserving rivers for recreation. Discusses the characteristics and potentials of the Kettle and Mississippi Rivers as possible additions to the State's wild and scenic rivers system--both rivers are close to the St. Paul-Minneapolis metro area and are under pressure to be developed.

52. River Conservation Fund. 1977. Flowing free: a citizen's guide for protecting wild and scenic rivers. 76 p. River Conserv. Fund, Washington, D.C.

Approaches that may be useful in river preservation are presented. The National Wild and Scenic Rivers Act is discussed. The designation process is explained, classification criterion and objectives are presented, and the present status of the System is detailed. State Wild and Scenic Rivers programs are briefly reviewed and a list of State contacts is provided. Examples of local and private preservation efforts are presented as are processes that may be useful in mobilizing the grassroots support needed in a preservation effort.

53. Royer, Lawrence E., Wm. H. Becker, and Richard Schreyer, eds. 1977. Managing Colorado River whitewater--the carrying capacity strategy. Inst. for the Study of Outdoor Recreation and Tourism, Dep. For. and Outdoor Recreation, Utah State Univ., Logan, Utah.

Includes papers by managers and researchers on the issue of carrying capacity of whitewater rivers in the canyon country of Utah. Includes articles on the concept and meaning of protected wildlands, the physical resource and social determinants of whitewater recreation, and social inputs to carrying capacity decisions.

54. Schreyer, Richard. 1976. Behavioral research on whitewater rivers. Utah Tourism and Recreation Rev. 5(1):1-5.

Discusses the development of a behavioral information data-bank to aid recreation managers who are responsible for whitewater rivers. Behavioral information needed about users is: (1) who are they, (2) where do they come from (mentally and geographically), and (3) what do they want? This information would: (1) identify the kinds of experiences users want, (2) allow managers to receive direct feedback on special actions, and (3) help managers "to see" the people using the resource instead of just using "visitor days" and "camper nights" to describe them.

55. Simmons, Robert M. 1977. Legal aspects of river recreation management in the West. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 32-37. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Analyzes the levels of law the river manager should be familiar with; emphasis is on the recent Federal statutes affecting the use of the Nation's waterways. Also analyzes the effects of determining: (1) the navigability of a waterway, (2) the importance of the reservation doctrine, and (3) the effect of existing and future appropriations on river recreation management.

56. Sumner, David. 1975. Will the Dolores live up to its name? Sierra Club Bull. 60(7):4-5.

Chronicles the gradual deterioration of the Dolores River in southwestern Colorado. Notes diversity of ecological realms along the river and describes a river trip from Cahone and Bedrock to the Colorado River in Utah. Urges preservation of the river in the National Wild and Scenic Rivers System.

57. Sumner, David. 1976. Wild rivers, flowing free. Nat. Wildl. 14(4):20-27.

Documents the problems involved in preserving six of the rivers that are either included in the National Wild and Scenic Rivers System or are being studied to be included. Discusses controversial issues and problems involved in preserving the areas yet managing them for various types of activities.

58. Tarlock, Dan A. 1967. Preservation of scenic rivers. Kentucky Law J. 55(4):745-798.

Suggests that preserving free-flowing water is a public value that should be considered in water resources planning decisions. Offers methods of incorporating these values into the decision-making process. States that at present, preservation is a value secondary to development and that existing laws favor short term uses of water (power generation, flood control, and irrigation) over long term uses. Maintains that technology will continue to increase leisure time and that preserving some of the remaining unharnessed stretches of rivers will help sustain important recreational opportunities.

59. Thompson, Glenn. 1976. Lucky river: the Little Miami. Environmental Comment, June 1976. p. 13-16. Urban Land Inst.

Briefly discusses the historical significance of the Little Miami River in southwest Ohio. Describes the processes that a nonprofit organization, Little Miami, Inc., undertook to rally support for protection of the River. Provides examples of accomplishments by the organization, individuals, and public agencies to protect the River.

60. Tippy, Roger. 1968. Preservation values in river basin planning. Nat. Resour. J. 8(2):259-278.

Three values are identified as reasons for preserving streams: recreation, fish, and a set of intangibles such as wilderness, natural beauty, and historic and scientific values. Major development values of rivers are: agricultural and domestic consumption, flood control, navigation, hydroelectric power, dams, and soil conservation. Conflicts between preservationists and developers often occur thereby establishing a need for comprehensive river basin planning. Ideally planners should either present decision-makers with a choice of alternatives for a given river or a single answer that does not dissatisfy one interest group more than another. The comprehensive planning program for the Upper Missouri River basin could guide other river basin planning efforts.

61. Turner, Robert C. 1974. The preservation of rivers as wild and scenic. *In* Environmental planning: law of land and resources. p. 8.1-8.16. Arnold W. Reitze, Jr., ed. North Am. Interntl., Washington, D.C.

Presents a brief history of the Wild and Scenic Rivers Act. Comments on the procedures followed to preserve rivers under the Act and the management guidelines followed to protect both the river and its corridor. Riverways that are protected by other Federal legislation, such as the Jacks Fork and Current Rivers in the Missouri Ozarks and the Buffalo River in Arkansas, are also mentioned. The effectiveness of measures used to protect these rivers are briefly compared with measures used to protect rivers under the Wild and Scenic Rivers Act. State scenic river programs as they relate to eligibility requirements for Federal land and water conservation funds are discussed also.

62. U.S. Department of Interior, Bureau of Outdoor Recreation. 1970. National symposium on wild, scenic and recreational waterways: proceedings. September 10-12, 1970. 209 p. St. Paul, Minnesota.

A collection of papers that reviews the Wild and Scenic Rivers Act of 1968, answers the most frequently asked questions regarding the Wild and Scenic Rivers System, discusses complementary State river programs, and outlines methods for implementing the various rivers programs.

63. U.S. Department of Interior, Bureau of Outdoor Recreation. 1976. Northeast regional states scenic rivers planning workshop. Summary of Proceedings. May 25-27, 1976. Rexford, Pennsylvania. 117 p.

Summarizes the discussions of State and Federal resource administrators responsible for river planning and management in the Northeast. Important topics discussed were: (1) the river study process; (2) the river designation process; (3) the development of a river management plan and implementation process; and (4) status of the National and Wild Scenic River System.

64. U.S. Department of Interior, Bureau of Outdoor Recreation. 1977. Outdoor recreation action: wild and scenic river. 43:1-48.

Discusses America's wild and scenic rivers and efforts to protect and preserve them. Articles feature: a status report on river preservation and recreation programs; a summarization of various State stream protection programs (key contacts in State government charged with river protection are listed); a review of Federal Wild and Scenic River protection efforts; and a summary of the River Recreation Management and Research Symposium held in Minneapolis in January 1977.

65. U.S. Department of Interior, Fish and Wildlife Service. 1975. Proceedings of the National wetland classification and inventory workshop. July 20-23, 1975. College Park, Maryland. 248 p. & addendum. Washington, D.C.

Contains overviews of current wetland classifications and inventories in the United States and Canada by various public agencies (both State and Federal) and private organizations. Workshop session discussions are provided. Appended section incorporates many suggestions that emanated from the workshops.

66. U.S. Senate Select Committee on National Water Resources. 1960. Water resources activities in the United States; water recreation needs in the United States, 1960-2000. Comm. Print 17, 86th Congr. 2d. Sess. Gov. Print. Off., Washington, D.C.

Covers such topics as the rapidly increasing use of water-based areas, problems of intensive use and crowding, planning for additional areas, public water supply legislation, and inadequate criteria for estimating future water-based recreation needs. Contains 17 recommendations by the National Park Service regarding Federal objectives for water-related recreation areas. An Appendix contains recommendations for general policy by the Committee.

67. Utter, Jack G., and John D. Schultz. 1976. A handbook on the Wild and Scenic Rivers Act. 44 p. Sch. For., Univ. Montana, Missoula, Montana.

Booklet is divided into four parts: (1) text of the Act, (2) section-by-section review of the Act, (3) texts of legislation enacted by Congress since the Act passed that pertain directly to the Act, and (4) Federal regulations and the Wild and Scenic Rivers Act.

INVENTORY AND CLASSIFICATION METHODS

(Also see reference numbers 31, 34, 38, 65)

68. Arighi, Scott, and Margaret S. Arighi. 1974. Wildwater touring. 334 p. MacMillan Co., Inc., New York, New York.

Contains a section on a method for classifying rivers as to the difficulty the river user experiences while attempting to navigate the river. Difficulty ratings are also defined by the type of water craft used to float a river.

69. Aukerman, Robert, and George Chesley. 1971. Classifying water bodies: feasibility and recommendations for classifying water. 123 p. Final Report, Dep. Recreation Resour. Colorado State Univ., Ft. Collins, Colorado.

Determines the feasibility of classifying water bodies and segments of water bodies by potential use. Identifies criteria for a water classification system and evaluates existing natural resource classification systems. Finds that satisfactory classification by potential optimum use requires a comprehensive planning process that identifies conflicts and is basically a decision-making system.

70. Bauman, Eric Hans. 1976. A method for assessing river recreation potential. M.A. thesis. Dep. Geogr., Michigan State Univ., East Lansing, Michigan. 188 p.

Develops an objective method to evaluate the recreational potential of riparian corridors and to inventory existing river characteristics. Sixty-seven variables in eight categories were evaluated along river segments of the Pine, Manistee, and Looking Glass Rivers in Michigan. Each variable was ranked for 16 recreation activities. A literature review of techniques for assessing recreation values is included.

71. Borden, Yates F., Brian J. Turner, and Charles H. Strauss. 1977. Colorado River campsite inventory. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 226-231. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Shoreline beaches along the Colorado River in the Grand Canyon are regularly used by river-running parties as overnight campsites. The availability of campsites in river sections where they are scarce, small, or both, limits the number and size of parties that can be permitted without risking unacceptable environmental degradation. Therefore, a comprehensive inventory of usable campsites was made and it revealed that 345 campsites are available for overnight camping by river-running parties.

72. Calvin, James S., John A. Dearinger, and Mary Ellen Curtis. 1972. An attempt at assessing preferences for natural landscape. Environ. Behav. 4(4):447-470.

Two samples of college students were asked to judge 15 different views of natural scenery on each of 21 different scales. Results suggest that there may be two major dimensions people use in subjective assessments of natural scenery: natural scenic beauty and natural force-natural tranquility. Scenic beauty moves along scale dimensions from beautiful to ugly. Natural force scenes are judged as being turbulent, loud, rugged, and complex; and natural tranquility scenes are tranquil, hushed, delicate, and simple.

73. Carlson, J. E., D. L. Grant, E. L. Michalson, J. H. Mulligan, and J. K. Van Leuven. 1976. Developing criteria to classify wild and scenic rivers. Res. Tech. Completion Rep. 117 p. Idaho Water Resour. Res. Inst., Univ. Idaho, Moscow, Idaho.

Presents a multidisciplinary effort to develop river classification alternatives. Physical, economic, and community density factors were each given a numerical value on six natural river stretches along the Priest River and Priest Lake in Idaho. The values were then used to compare the suitability of each of the stretches with the 3 classification criteria (wild, scenic, recreational) specified under the National Wild and Scenic Rivers Act.

74. Cherem, Gabriel J., and David E. Traweek. 1977. Visitor employed photography: a tool for interpretive planning on river environments. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 236-244. North Cent. For. Exp. Stn., St. Paul, Minnesota.

The methodology of visitor employed photography (VEP) is explained as a device to inventory public perception of natural environments. A VEP study on the Huron River in Michigan is summarized and the use of VEP findings in the development of interpretive services and programs for river environments is discussed.

75. Chubb, Michael. 1977. River recreation potential assessment: a progress report. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 83-90. North Cent. For. Exp. Stn., St. Paul, Minnesota.

In the past most river recreation was managed from the viewpoint of rectangular land areas rather than complete river systems. Managing from a river-oriented viewpoint gained momentum with the passage of the Federal Wild and Scenic Rivers Act, but no widely adopted method of assessing river recreation potential has yet been developed. Several approaches to potential assessment are summarized. The RIVERS Method involves assessing 67 variables for each mile of river and evaluating the potential for 16 recreational activities.

76. Chubb, Michael, and Eric H. Bauman. 1977. Assessing the recreation potential of rivers. J. Soil and Water Conserv. 32(2):97-102.

Although many ways of assessing river recreation potential have been suggested, no universally applicable method has been devised. The RIVERS Method, currently under development for the USDA Forest Service, attempts to evaluate and compare the potential of all types of rivers for recreation activities.

77. Coomber, Nicholas H., and Asit K. Biswas. 1973. Evaluation of environmental intangibles. 74 p. Genera Press, Bronxville, New York.

Reviews the state of the art of evaluating intangible benefits and costs associated with the use of the environment. Cites Leopold's inventory technique to assess environmental quality of rivers as being more illustrative rather than analytic. Distinguishes between two types of classification techniques: monetary evaluations of environmental intangibles and nonmonetary evaluations of the physical environment.

78. Craighead, Frank C., Jr., and John J. Craighead. 1965. River systems-recreational classification, inventory and evaluation. Naturalist 16(3):33-43. (Reprinted from Naturalist 13(2), 1962.)

Proposes a method to inventory and evaluate river recreation resources based on size, condition, and recreation use of the rivers. Delineates four classes of rivers: wild, semiwild, semiharnessed/developed, and harnessed/developed.

79. Dearinger, John A. 1968. Aesthetic and recreational potential of small naturalistic streams near urban areas. Res. Rep. 13, 260 p. Water Resour. Res. Inst., Univ. Kentucky, Lexington, Kentucky.

A method was developed to evaluate aesthetic and recreational potential of streams and watersheds based on previous work by the U.S. Soil Conservation Service and on the principles of terrain analysis, land use planning, and outdoor recreation economics. Evaluations of stream recreation potential for activities such as camping, fishing, and hiking were made. Concludes that aesthetic and recreational values can be identified, inventoried, and used to evaluate a watershed's development potential; and that accurate estimates of participation demand, acreage requirements for various activities, and benefits gained (by both users and developers) from recreational developments can be projected.

80. Dearinger, John A., and George M. Woolwine. 1971. Measuring the intangible values of natural streams: Part I--applications of the uniqueness concept. Res. Rep. 40, 86 p. Water Resour. Res. Inst., Univ. Kentucky, Lexington, Kentucky.

Applies Leopold's river inventory system for uniqueness to 58 natural streams in Kentucky. Concludes that the concept is useful to evaluate the uniqueness of a group of streams. Encourages further integration of the uniqueness concept into benefit-cost analysis and makes specific recommendations for further research.

81. Dearinger, John A., George M. Woolwine, Charles R. Scroggin, D. Daland, and J. Calvin. 1973. Measuring the intangible values of natural streams: Part II--preference studies and completion report. Water Resour. Res. Inst. Res. Pap. 66, 206 p. Univ. Kentucky, Lexington, Kentucky.

A method that utilizes color slides and a semantic differential rating scheme was developed to measure people's preferences for natural landscapes. Concludes that: scenes with running water are preferred over scenes with still or no water; stark beauty of a desert, lava flow, or winter pasture is not perceived as beauty by most people; some types of visual pollution (i.e., billboards) are not recognized as such by many people; occupation and lifestyle have more of an effect on an individual's concept of natural beauty than does age or sex; and people generally agree on what is very beautiful or very ugly but not on the in-between.

82. deBettencourt, James, and George L. Peterson. 1977. Standards of environmental quality for recreational evaluation of rivers. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 245-255. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Explores the possibility of developing criteria and standards based upon the individual and groups threshold functions by which alternative river recreation sites are accepted or rejected. Explains experimental procedures used to develop the threshold functions. Presents illustrative results of pilot studies. Suggests applications and needs for further research.

83. Dyer, A. Allen. 1969. Recreation site selection: a conceptual approach. 23 p. Inst. Study Outdoor Recreation Tourism, Utah State Univ., Logan, Utah.

Proposes formulating a computerized recreation land model that would incorporate consumer preferences in selecting recreation sites for development. The data base for the model would rest on physical characteristics of the proposed site. Two types of data are needed to operate the model: an assessment of environmental characteristics required for several activities and an inventory of land characteristics pertinent to site quality. Three groups of recreational activities are identified: water based, land based, and winter.

84. Frissell, Sidney S., Jr., and Donald P. Duncan. 1965. Campsite preference and deterioration. J. For. 63(4):256-260.

Describes research undertaken in the Quetico-Superior canoe country of Minnesota and Ontario to determine (a) preferences of canoeists for campsites, (b) character and degree of campsite deterioration, and (c) feasibility of developing prediction equations for campsite durability. Regression analyses were used to develop an equation for the prediction of the durability of alternative sites that might be developed in the future to disperse camping use.

85. Gilchrist, Martin C. 1971. Strategies for preserving scenic rivers: the Maryland experience. Landscape Archit. 62(1):35-42.

Describes procedures to evaluate Maryland rivers for potential scenic river protection. Criteria for protection include physical, biological, and human conditions along a river and its corridor.

86. Gunn, Clare A., John W. Hanna, Arthur J. Parenzin, and Fred M. Blumberg. 1974. Development of criteria for evaluating urban river settings for tourism-recreation use. Texas Water Resour. Inst., Tech. Rep. 56, 98 p. Texas A&M Univ., College Station, Texas.

Develops criteria to enable cities to evaluate the potential for business-recreation development along downtown waterfront locations. Suggests that development will stimulate revival of downtown areas and will allow diverse interests to coordinate leadership on resource management. Examples of waterfront redevelopment in various American cities are presented.

87. Hamill, Louis. 1974. Statistical test of Leopold's system for quantifying aesthetic factors among rivers. Water Resour. Res. 10(3):395-401.

Criticizes Leopold's inventory method to quantify the aesthetic factors of rivers. Statistical tests show small correlation between uniqueness ratios in Leopold's method and other rating methods. Anomalies were also found in graphic derivation of Leopold's technique. Suggests that a number-ranking system would be a more efficient evaluation tool.

88. Hamill, Louis. 1975. Analysis of Leopold's quantitative comparisons of landscape aesthetics. J. Leisure Res. 7(1):16-28.

In 1969 Luna B. Leopold published a system for quantitatively comparing landscape aesthetics. This system had several features such as the uniqueness ratios and distinctive graphical procedures for deriving river and valley character. An examination of Leopold's checklist for landscape factors reveals that the system for rating each factor is inconsistent. Inconsistency is justified as not introducing bias and personal preferences into the analysis. The use of uniqueness ratios appears to have been required in order to accommodate the inconsistent scaling of factors to numerical analysis. The addition of uniqueness ratios produces difficulties of comprehension and interpretation. The graphical procedures use a small amount of information and complex graphical techniques to produce scales of river and valley character. Analysis of the system suggested that consistent rating of environmental factors and the addition of factor scalings might have produced comparable results more effectively.

89. Hamill, Louis. 1977. Methods used for evaluating recreational rivers in Canada. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 273-278. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Reviews techniques for describing and evaluating recreational rivers in Canada. Considers methods developed and/or tested in Canada and methods developed elsewhere that have been applied in Canada.

90. Hammon, Gordon A., Harold K. Cordell, Lewis W. Moncrief, M. Roger Warren, Richard A. Crysdale, and John Graham. 1974. Capacity of water-based recreation systems Part II: a systems approach to capacity analysis. Water Resour. Res. Inst. Rep. 90, 46 p. North Carolina State Univ., Raleigh, North Carolina.

Develops methods, models, and guidelines useful to managers who are interested in measuring or predicting the recreational output of lakes. Presents several explanatory models representing individual and group behavior of pleasure boaters.

91. Herbst, John R. 1972. Report of forest subprojects: a methodology study to develop evaluation criteria for wild and scenic rivers. 52 p. Water Resour. Res. Inst., Univ. Idaho, Moscow, Idaho.

Presents a timber inventory of the Salmon River basin to determine the impact that the wild and scenic river classification would have on timber harvesting activities in the area. Notes that timber-market boundaries rather than geographic boundaries are more relevant when examining and comparing the effects river classification would have on the timber industry. Concludes designation in the National Wild and Scenic River System would have little effect on timber harvesting activities.

92. Herbst, John R. 1973. Report of range subproject: a methodology study to develop evaluation criteria for wild and scenic rivers. Scenic Rivers Study Rep. 3, 49 p. Water Resour. Res. Inst., Univ. Idaho, Moscow, Idaho.

Discusses the importance of grazing in the Salmon River basin and the effects Federal wild and scenic river designation might have. Develops an evaluation method to determine the impact of designation on grazing and concludes that little conflict would exist.

93. Herrington, Roscoe B., and S. Ross Tocher. 1967. Aerial photo techniques for a recreation inventory of mountain lakes and streams. USDA For. Serv. Res. Pap. INT-37, 21 p. Intermt. For. Range Exp. Stn., Ogden, Utah.

Describes the results of aerial photo techniques tested on the north slope of the Uinta Mountains in Utah to measure physical characteristics of mountain lakes and streams. Compares the accuracy of photo determination with field measurements of lake depth. Describes procedures for all-photo measurements in the inventory. Concludes that a substantial amount of descriptive data can be obtained from aerial photos.

94. Hooper, R. A. 1977. Assessing the recreational potential of waterways: a description and evaluation of selected systems. Res. Pap. 77-1, 51 p. Navigable Mt. Rivers Study, Nat. Hist. Res. Div., Parks Canada, Western Region, Calgary, Alberta.

Describes and evaluates systems suitable for measuring the recreational potential of waterways--particularly canoeing, kayaking, rafting, and activities associated with these forms of recreational boating. These systems were tested on the Gammon River in Manitoba in 1974.

95. Hooper, R. A. 1977. A guide to the nature of mountain rivers and whitewater. Res. Pap. 77-2, 31 p. Navigable Mt. Rivers Study, Nat. Hist. Res. Div., Parks Canada, Western Region, Calgary, Alberta.

Acquaints the reader with some aspects of mountain river hydrology, channel morphology, and the hydraulic principles affecting whitewater features. Also, briefly discusses a system developed to rate the paddling difficulty of whitewater.

96. Hooper, R. A. 1977. A system to inventory and evaluate mountain rivers for canoeing and kayaking: a basis for the determination of recreational potential. Res. Pap. 77-3, 70 p. Navigable Mt. Rivers Study, Nat. Hist. Res. Div., Parks Canada, Western Region, Calgary, Alberta.

Outlines the steps taken to determine the recreational potential of several Canadian mountain rivers. First, a detailed inventory and evaluation of the rivers was completed. Then, management and operational guidelines pertaining to canoeing, kayaking, and rafting were developed. General management concerns included: requiring registration systems, establishing public safety programs, establishing recreational carrying capacity limits and procedures, establishing restrictions and guidelines for on-shore activities related to boating, and assessing public information requirements. Also river users should be surveyed to help develop the management plans. A questionnaire used for this purpose on Canadian rivers is presented.

97. Juurand, Priidu. 1972. Summary report on the wild rivers survey, Yukon Territory, 1971. 25 p. Can. Dep. Indian Aff. North Dev., Natl. Hist. Parks Branch, Plann. Dev., Ottawa, Canada.

Summarizes a wild rivers survey conducted in the Yukon Territory during the summer of 1971. Information was collected to test methods (such as Leopold's uniqueness ratio) for ranking rivers for inclusion in a system of wild rivers. Subjective analysis of each study river was conducted and the results are summarized. Recommends inclusion of the Yukon and Ogilvie-Peel Rivers in a Canadian wild and scenic rivers system.

98. Juurand, Priidu. 1972. Wild rivers survey 1971: quantitative comparison of river landscapes. Spec. Rep. 72-1, 29 p. Can. Dep. Indian Aff. North Dev., Natl. Hist. Parks Branch, Plann. Div., Ottawa, Canada.

Reviews wild river evaluation techniques and selects a modified version of Leopold's inventory method to use in collecting data on Canadian rivers. Recommends that historical, geological, biological, and recreational capability information be added to the inventory technique. Field test concludes Lewes-Yukon and Ogilvie-Peel Rivers as high-priority considerations for Canadian wild and scenic river status.

99. Knudson, Douglas M. 1976. A system for evaluating scenic rivers. Water Resour. Bull. 12(2):281-289.

Describes a system for evaluating rivers for classification in State programs. The system described was developed for Indiana rivers. Rivers must first meet minimum standards for naturalness and suitable adjoining land areas. Then they are rated on bank vegetation, stream course alterations, man-made structures and roads near and across the river, aesthetic quality of the water, and special natural features. Sample rating for the Tippecanoe River is included.

100. Kuska, James J., J. S. Edstrom, and M. H. Smithberg. 1974. St. Croix-Namekagon River Resource Inventory. Agric. Exp. Stn. Misc. Rep. 122-1974, 23 p. Univ. Minnesota, St. Paul, Minnesota.

Describes a method used to categorize resource features for evaluation of recreation site potential along the St. Croix and Namekagon Rivers in Wisconsin and Minnesota. Three environmental factors were studied: (1) regional characteristics (geology, topography, soils, vegetation), (2) river criteria (length, gradient, width, rapids, sinuosity, island) and (3) cultural features (roads, railroads, towns, residences). The optimum location for developing user facilities can be determined by using this method.

101. Kuska, James, and Vince A. Lamarra, Jr. 1973. Use of drainage patterns and densities to evaluate large scale land areas for resource management. J. Environ. Syst. 3(2):85-100.

A 6,800 square mile watershed (St. Croix River, Minnesota-Wisconsin) was studied using the pattern analysis technique. Drainage densities were correlated with soil textures and vegetation and inferences were made about the innate ecological diversity and management potential of the watershed. The information gained from this technique should aid managers in recognizing the diversified nature of a watershed and areas within it that are best suited for road building, logging, recreation development, and wildlife management.

102. Leopold, Luna B. 1962. Rivers. Am. Sci. 50(4):511-537.

Analyzes the hydrologic cycle and the river's role in water transfer. Groups river characteristics into three broad categories: river channel, river valley, and drainage nets. Reviews research conducted on various river characteristics. Lists additional areas needing to be researched: mechanics of sediment transportation, energy dissipation in rivers and its effect on erosion or deposition, and methods of material transport from slopes into river channels.

103. Leopold, Luna B. 1969. Landscape aesthetics. Nat. Hist. 78(8):36-45.

Discusses the development of an inventory method to compare the aesthetic uniqueness of Hell's Canyon of the Snake River in Idaho with 11 other river valleys in Idaho.

104. Leopold, Luna B. 1969. Quantitative comparison of some aesthetic factors among rivers. USDI Geol. Surv. Circ. 620, 16 p. Washington, D.C.

Develops a quantitative inventory and evaluation technique based on the assumption that a unique landscape has more significance than a common one. Defines the physical, biological, and cultural characteristics of 12 Idaho rivers and 4 National Park rivers in terms of 46 variables. A measure of uniqueness is derived by summing the calculated ratios for each variable.

105. Leopold, Luna B., and Maura O'Brien Marchand. 1968. On the quantitative inventory of the river-scape. Water Resour. Res. 4(4):709-717.

Develops a way to quantify the presence or absence of factors that contribute to aesthetic values of a river landscape as expressed by a uniqueness ratio. Discusses inherent difficulties in such research but suggests that the techniques can be a valuable procedure in river-basin planning.

106. Libby, David. 1975. The recreational potential of selected rivers in New Brunswick. 78 p. Plann. Sect., Tech. Serv. Branch Dep. Tourism, Fredericton, New Brunswick.

Uniqueness ratios were calculated for 18 rivers in New Brunswick using Leopold's basic concept. Rivers were ranked on quality, aesthetic appeal and human interest and total attractiveness. User conflicts related to recreation canoeing and associated activities were identified. The river's natural attractiveness, scope of significance, average canoeability, and the apparent likelihood of misuse were considered and each of these factors were rated and summed.

107. Litton, R. Burton, Jr. 1977. River landscape quality and its assessment. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 46-54. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Illustrates the elements of visual assessment of river landscapes: (1) landforms, (2) vegetation patterns, (3) water presence and expression, (4) human use and impacts, and (5) other influences. Discusses how to inventory landscapes at large and small scales of application, and with implications of planning and design policies. Points up problems of evaluating landscape quality using criteria such as aesthetics applied to landscape, professional judgment, and perceptual studies.

108. MacConnell, William P., and G. Peter Stoll. 1968. Use of aerial photographs to evaluate the recreational resources of the Connecticut River in Massachusetts. Holdsworth Nat. Resour. Cent. & Exp. Stn., Coll. Agric. Bull. 578, 65 p. Univ. Massachusetts, Amherst, Massachusetts.

Develops and tests aerial photographic techniques on the Connecticut River to identify and classify river-oriented recreation sites. Analyzes two sets of aerial photos for land uses and development trends. Identifies 102 land use types, and presents a statistical summary of the land (by political unit) for analyzing the recreation potential of the River.

109. MacConnell, William P., and H. Ross Pywell. 1969. Use of aerial photographs to evaluate the recreational resources of the Connecticut River in Connecticut. Coll. Agric. Exp. Stn., Bull. 574, 73 p. Univ. Massachusetts, Amherst, Massachusetts.

Develops and tests aerial photographic techniques for identifying and classifying river-based recreation sites on the Connecticut River. System is used to describe and to note changes in vegetation and land use characteristics.

110. Melhorn, Wilton N., Edward A. Keller, and Richard A. McBane. 1975. Landscape aesthetics numerically defined (LAND system): application to fluvial environments. Tech. Rep. 1, 169 p. Water Resour. Res. Cent., Purdue Univ., Lafayette, Indiana.

Develops a quantitative method for objectively assessing aesthetic values in a fluvial landscape. The LAND system is an extension of Leopold's river inventory scheme. Five evaluative indices are utilized to assess environmental beauty: uniqueness, aesthetic value, scenic beauty, recreation potential, and wildness. Initial testing of the system indicates that participants consistently derive similar numerical values for beauty regardless of their educational background.

111. Michalson, Edgar L. 1974. Aesthetics of wild and scenic rivers--a methodology approach. Scenic Rivers Study Rep. 11, 139 p. Water Resour. Res. Inst., Univ. Idaho, Moscow, Idaho.

Study focuses on two tasks: developing a method to evaluate the aesthetic value of wild and scenic rivers and developing demand models for outdoor recreation to estimate how much recreation demand is related to aesthetics. Concludes that quantification of aesthetics is an imperfect art that requires more research.

112. Michalson, Edgar L., and Joel R. Hamilton. 1973. Summary report for a methodology study to develop evaluation criteria for wild and scenic rivers. Scenic River Study Rep. 10, 185 p. Water Resour. Res. Inst., Univ. Idaho, Moscow, Idaho.

Develops a method for river evaluation to determine which rivers should be included in the National Wild and Scenic River System. The Salmon River basin in Idaho was selected as a test case for the method. Study concentrated on the entire river basin and the effects wild and scenic river classification would have on basin resources. Two competing river resource uses identified were hydropower and recreation. Attempts were made to estimate trade-offs of hydropower development versus recreation in the Salmon River basin.

113. Michalson, Edgar L., and Joel R. Hamilton. 1975. A methodology for evaluating development-environmental conflicts on wild and scenic rivers. Water Resour. Bull. 11(6):1149-1156.

The Salmon River in Idaho is used as an example in formulating a three-step process for examining environment-development conflicts. The process involves: (1) inventorying resources to determine areas of conflict affecting wild and scenic river status, (2) determining through an evaluation process which resources uses are viable for the river, and (3) comparing various resource uses to determine their economic trade-off values.

114. Morisawa, Marie. 1970. Evaluating riverscapes. *In* Environmental geomorphology. p. 91-106. Donald R. Coates, ed. State Univ. New York, Binghamton, New York.

Discusses a process to rank the intangible values of a riverscape. Reviews research in analyzing aesthetics and in quantitatively evaluating scenic beauty. Relates the pleasurable feelings of the observer in the environment to art criteria (i.e., arrangement of lines, mass, color, and space). Encourages research in methodology to predict user preferences so that riverscapes with outstanding scenic value may be preserved.

115. Morisawa, Marie. 1971. Evaluation of natural river environments. Phase II, Final Rep., 114 p. USDI Water Resour. Res. State Univ. New York, Binghamton, New York.

Methods of evaluating various aspects (physical, cultural, hydrologic, and aesthetic) of watersheds were tested on six rivers representing a variety of natural environments. Criteria to inventory and classify natural environments as well as methods to evaluate cultural (scenic and historic) values were identified. Application of methodology to watershed management and planning is stressed.

116. Morisawa, Marie, and Martin Murie. 1969. Evaluation of natural river environments. Final Rep., 143 p. USDI Water Resour. Res., Antioch College, Yellow Springs, Ohio.

Methods were devised to objectively identify and assess values (biological, geological, aesthetic, and recreational) of rivers in their natural, free-flowing state, and to compare these values with those of more developed rivers. Field data on fauna, flora, geology, hydrology, history, and aesthetics were collected for the Green River, Wyoming, and the Little Miami River, Ohio, to supply an inventory of features along each river. Although both rivers were considered natural and free-flowing, classification schemes and ratings for each value applied to these two rivers show sharp distinctions between them.

117. Morris, James A. 1976. Instream flow evaluation for outdoor recreation. *In* Instream flow needs Spec. Conf. and Symp. Proc., Vol. II, May 3-6, 1976, Boise, Idaho, p. 352-358. Am. Fish. Soc., Bethesda, Maryland.

Recreation is accepted as a legal, competing use for water. Planning guidelines accent the need for ways to evaluate trade-offs among all water uses. A method to subjectively evaluate the effects of different instream flows on river-related recreation activities is proposed. This method should be adaptable to current water resource planning guidelines and be simple to apply.

118. Natural Historical Parks Branch, Planning Division. 1973. Summary report wild rivers survey 1972. Spec. Rep. 73-3, 65 p. Can. Dep. Indian Aff. North Dev., Ottawa, Canada.

Summarizes a 1972 inventory of wild rivers in Canada. Study rivers were chosen for their potential national park-natural region representation, association with historic routes, or logistics. Results are presented by region: western mountain area, barrenlands area in the northwest, Canadian shield (central), Canadian shield (eastern), and Appalachians area in Newfoundland. Evaluation of river sections is based on river location, water and channel characteristics, valley characteristics, historical/cultural features, scenic quality, and recreation quality.

119. Niemann, Bernard J., Jr., Xavier A. Bonilla, and S. Richard Bruno. 1975. Rural landscape assessment: a comparative evaluation of high platform remote sensors. 243 p. Dep. Landscape Arch./Environ. Awareness Cent., Sch. Nat. Resour., Coll. Agric. and Life Sci., Univ. Wisconsin, Madison, Wisconsin.

The St. Croix and Namekagon River system and surrounding landscape in Wisconsin was used as the test site to compare and evaluate the usefulness of high platform remote sensing with conventional resource assessment methods. Results indicate that high altitude color infrared photography is comparable with conventional assessment methods. Good results were obtained through remote sensing.

120. Nighswonger, James J. 1970. A methodology for inventorying and evaluating the scenic quality and related recreational value of Kansas streams. Kansas Plann. Dev. Rep. 32, 119 p. Kansas Dep. Econ. Dev. Plann. Div., Topeka, Kansas.

Develops a technique for inventorying, evaluating, and analyzing Kansas' streams for visual quality and recreational potential. Concludes that the most significant streams, in terms of visual quality, are located in the eastern one-third of Kansas where water, topography, and vegetation combine for visual diversity.

121. Rickert, David A., and Walter G. Hines. 1975. A practical framework for river-quality assessment. USDI Geol. Surv. Circ. 715-A, 17 p. Washington, D.C.

Presents a seven-step framework for comprehensively assessing river quality: (1) determine existing and potential river quality, (2) analyze river hydrology, (3) select assessment methods, (4) collect data, (5) analyze data, (6) predict impacts on future planning, and (7) communicate results to clients. The Willamette River Basin in Oregon was used as a case study.

122. Sonnen, Michael B., Larry C. Davis, William R. Norton, and Gerald T. Orlob. 1970. Wild Rivers: methods for evaluation. Final Completion Rep., 116 p. Water Resour. Eng. Inc., Walnut Creek, California.

Develops two methods of evaluating wild and scenic river potential to include intangible, nonmonetary benefit values. Each method was tested on two adjacent river basins in Washington--the Upper Skagit (a currently developed basin) and the Sauk-Suittle (a wild river basin). The results of each test indicated that the Sauk-Suittle River should be left wild and the Skagit River could be more fully developed.

123. Stalnaker, C. B., and J. L. Arnette (ed.). 1976. Methodologies for the determination of stream resource flow requirements: an assessment. 199 p. USDI Fish and Wildl. Serv., Off. Biol. Serv., Lakewood, Colorado.

Examines techniques and methods used to assess instream flow requirements for fish and other aquatic life, wildlife, recreation activities, and aesthetic values. Discusses the measurement of recreation activities and the assessment of those social attitudes that affect demand or potential demand for stream-associated recreation resources. Analyzes the aesthetics of flowing streams and adjacent landscapes. Measuring aesthetics is discussed with emphasis upon viewer evaluation and environmental qualities.

124. Taylor, Gordon D. 1965. Approach to the inventory of recreational lands. Can. Geogr. 9(2):84-91.

Proposes a classification system of recreational lands based on characteristics that different land areas have in common and on the intensity of recreational use of various lands. Criteria used in classification include: attractibility, vegetative cover, slope, size, and availability of drinking water.

125. Taylor, Gordon D., and Clarke W. Thompson. 1966. Proposed methodology for an inventory and classification of land for recreational use. For. Chron. 42(2):153-159.

Presents a method to inventory and rank landscapes for recreational use. Utilizes four criteria to evaluate them: water, cover, slope, and relief. Delineates a four-fold process to both itemize and scale landscape types. The recreational potential of sites is based on the presence or absence of limiting factors that affect their development for recreational uses.

126. Terry, Claude E. 1977. A filter system for determining river suitability for National Wild and Scenic River status. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 372-379. North Cent. For. Exp. Stn., St. Paul, Minnesota.

A system of filter matrices is described and its application to rivers in the Appalachian plateau evaluated. Based upon subsequent aerial observation and input from users, the system appears applicable in identifying streams that could logically be considered for inclusion in the National Wild and Scenic River System.

ECONOMIC EVALUATIONS

(Also see reference numbers 46, 111, 112, 113, 117)

127. Bianchi, Dennis H. 1969. The economic value of streams for fishing. Res. Rep. 25, 119 p. Water Resour. Res. Inst., Univ. Kentucky, Lexington, Kentucky.

Presents the results of an interview study of Kentucky stream fishermen. Notes the decline of natural stream fisheries. Develops a method to estimate the economic and recreational value of streams to fishermen. When estimating net benefits for economic justification, the recreational value of "lost" natural stream fisheries should be deducted from the value gained through reservoir recreation. Concludes that the unit value of a fisherman-day varies as a function of both the geographical location of a stream and its state of naturalness.

128. Blank, Uel, and Sterling H. Stipe. 1971. Economic impact of the Crow Wing Trail, Wadena County, Minnesota. USDA Econ. Res. Serv. 467, 29 p. U.S. Dep. Agric., Agric. Exp. Stn., Univ. Minnesota, St. Paul, Minnesota.

Discusses efforts since 1964 by private groups, individuals, and government sponsored programs in Wadena County to develop the Crow Wing River for canoeing and related recreation activities. Positive economic impacts of development on surrounding communities have been: additional employment; about $50,000 per year of additional income; and, complementary rather than competitive with other recreation facilities in the County.

129. Davis, Robert K. 1963. Recreation planning as an economic problem. Nat. Res. J. 3(2):239-249.

States that perceiving the values to society of different amounts and kinds of recreation areas and facilities is the key to allocating future funding. Also, because no dichotomy between economics and aesthetics exists, economics (especially cost benefit analysis), is a useful tool at all levels of recreation planning. Concludes that nearly all forms of outdoor recreation are susceptible to market analysis and that it is feasible to study markets to determine demand for and user's value of the types of outdoor recreation that guide user choices.

130. Dean, J. H., and C. S. Shih. 1975. Decision analysis for the river walk expansion in San Antonio, Texas. Water Resour. Bull. 11(2):237-244.

Recommends that the decision to expand the walkway should be based on the walkway's intangible attributes--such as recreational value and social impacts--as well as its tangible attributes--such as cost. Applies decision analysis techniques with multi-attribute utility theory rankings to assess tangible and intangible attributes. This method of decision making ensures that intangible benefits are considered.

131. Dwyer, John F., John R. Kelly, and Michael D. Bowes. 1977. Improved procedures for valuation of the contribution of recreation to national economic development. Res. Rep. 128, 218 p. Water Resour. Cent., Univ. Illinois, Urbana-Champaign, Illinois.

Presents procedures for evaluating criteria for water and related land resources. Federal agencies use the interim unit day value approach almost exclusively. This approach has little theoretical or empirical justification and does not encourage efficient allocation of resources. It is recommended that models be developed to predict individual willingness-to-pay for many types of recreation as functions of site characteristics, the characteristics of the individual user, the availability of substitute activities and sites, and the location of the individual in relation to the resources under study. The total value of the resource would be a function of these variables, the number of users, and the distribution of users within the market area. These functions may be derived from regional travel cost demand functions or could be explicit willingness-to-pay functions derived from the survey method.

132. Dyer, Allen A., and R. J. Whaley. 1968. Predicting use of recreation sites. Utah Agric. Exp. Stn. Bull. 477, 21 p. Logan, Utah.

Reports on an effort to produce a measurement model to predict recreation use. Assumes that other satisfactory models have been developed for predicting travel to competing market centers and for predicting market areas for shopping centers. Based on this assumption the measurement model is defined as a modification and combination of the gravity model and the theory of intervening opportunities. Suggests that these approaches to measuring use can be combined because both have the same influencing factors (available opportunities at site being examined, competing opportunities, and impact of travel distance).

133. Kelly, William F. 1970. Interrelationships among water-based recreation areas. *In* Western agricultural economics recreation Proc., p. 129-133. Oregon State Univ., Corvallis, Oregon.

Study on three Nevada lakes--Lake Tahoe, Pyramid Lake, and Lahontan Reservoir--to determine interrelations of demand for water-based recreation for specific sites. Author concludes that distance might not be a reliable substitute for price and that distance variables may often be highly interrelated. Suggests that other methods should be investigated in any further attempts to measure demand and demand interrelations for recreation areas. States that research should be conducted to measure recreational activities separately rather than as a whole because activities could be competitive.

134. King, David A. 1977. Economic evaluation of alternative uses of rivers. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 60-66. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Reviews the benefit-cost analysis decision criterion and the concept of opportunity cost. Outlines how to measure recreational benefits using the Hotelling-Clauson-Knetsch model. Discusses data and research needs for using benefit-cost analysis as a tool for making river management decisions. Concludes that the ability to use benefit-cost analysis in river management exists and should be exercised.

135. Knetsch, Jack L. 1971. Value comparisons in free-flowing stream development. Nat. Resour. J. 11(4):624-635.

States that current methods of evaluating recreation benefits are incapable of indicating how the demand curve changes with the type of recreation. The role of conventional prices in outdoor recreation is muted because a large portion of the cost is publicly provided. The availability of goods and services is as important for recreation as it is for other goods and services. There are two main considerations for estimating the values of the recreation opportunities that may be provided: (1) number of people it affects, and (2) user's willingness to pay.

136. Knetsch, Jack L. 1974. Outdoor recreation and water resources planning. Water Resour. Monogr. 3, 121 p. Am. Geogphys. Union, Washington, D.C.

Summarizes advances in existing techniques to quantitatively determine the demand for recreational opportunities and to estimate the value of such opportunities. Previous attempts to quantify recreational demand used projection models based on population, average income, and distance traveled to recreation sites. Some ways to estimate recreational values have been the market value method, cost method, willingness to pay, and gross expenditures method.

137. Krutilla, John V. 1970. Evaluation of an aspect of environmental quality. Soc. Stat. Sect. Proc. 1970:198-206.

Reports on a study to aid resource allocation decisions involving amenity aspects of the river environment of Hell's Canyon on the Snake River in Idaho. A comparative evaluation of the unique geomorphologic-hydrologic characteristics of the site and hydro-electric alternatives is made. Introduces a means of quantifying the costs and benefits of preserving the Canyon.

138. LaPage, Wilbur F., Paula L. Cormier, George J. Hamilton, and Alan N. Cormier. 1975. Differential campsite pricing and campground attendance. USDA For. Serv. Res. Pap. NE-330, 6 p. Northeast. For. Exp. Stn., Upper Darby, Pennsylvania.

Price differentials, including a premium for waterfront campsites and a preferential rate for State residents, were introduced at a New Hampshire State Park in 1973. Total revenue increased by 61 percent. Permit data before and after the change showed that attendance by State residents increased significantly. The differentials did not produce longer or more frequent visits by State residents nor a decline in the use of waterfront sites. Declines in visit length and party size appeared to be independent of fee policies.

139. Merewitz, Leonard. 1966. Recreational benefits of water resource development. Water Resour. Res. 2(4):625-640.

A pilot test of a demand model to measure recreationists' willingness to pay for various activities (boating, fishing, etc.) was conducted at Lake of the Ozarks in Missouri. The test identified four factors as necessary components of the demand model: population, population density, distance from the recreation site, and mean income of recreationists. Factors such as mobility and availability of alternative recreational activities did not appear to be useful factors for this model.

140. Michalson, E. L. 1977. An attempt to quantify the aesthetics of Wild and Scenic Rivers in Idaho. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 320-328. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Describes the procedure used to estimate demand for outdoor recreation on rivers. Also describes the development of a Likert-type scale to distribute the net resource values estimated in the demand analysis according to perceptions that users indicated as being important to the wild and scenic river experience.

141. Parent, C. R. Michael, and Franklin E. Robeson. 1977. Effects of National Park Service and Forest Service regulations on concession operations. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 334-341. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Examines the impact of USDA Forest Service and National Park Service regulations on the market structure of commercial float trip companies under their respective jurisdictions. Discusses price and quantity aspects of demand and differences in regulations.

142. Stern, Carlos David. 1974. Hydropower vs. wilderness waterway: the economics of Project Justification through the sixties. J. Leisure Res. 6(1):46-57.

Presents a critical review of the cooperative study by the U.S. Department of Interior's Bureau of Reclamation and National Park Service and the Army Corps of Engineers in the early 1960's. The study analyzes alternatives for developing the last major natural stretch of the upper Missouri River, scrutinizes recreation benefits at reservoirs and on wilderness waterways, and suggests willingness to pay and opportunity costs as two approaches to better measure such benefits.

143. Stevens, Joe B. 1966. Recreation benefits from water pollution control. Water Resour. Res. 2(2):167-182.

Presents a method for estimating direct recreation benefits from water pollution control using a model of biological-behavioral relations involved in sport fishing. Angling success per unit of effort was taken to represent the quality of the recreation experience. Direct recreation benefits were identified as fishing success per unit of effort that would result from the prevention of water pollution.

144. Stroup, R. L., M. D. Copeland, and R. R. Rucker. 1976. Estimation of amenity values as opportunity costs for energy-related water use in Montana. Montana Univ. Joint Water Resour. Res. Cent. Rep. 81, 51 p. Dep. Agric. Econ., Montana State Univ., Bozeman, Montana.

It is increasingly important that the value of water resources for nonconsumptive uses, such as recreation, be quantified. Numerous methods of site evaluation have been attempted but all have encountered problems stemming from the use of proxies for consumers willingness to pay for site use. A fee experiment for a specific site on the Yellowstone River is specified in detail. This method avoids the problems associated with proxies for consumer willingness to pay.

145. Trock, W. L., and R. D. Lacewell. 1973. An economic evaluation of a water-based urban tourist attraction in San Antonio, Texas. Tech. Rep. 48, 92 p. Water Resour. Inst., Texas A&M Univ., College Station, Texas.

Determines the economic effects of the Paseo Del Rio on commercial enterprises and activities as they relate to tourism and recreation in the central city. Three surveys were conducted. The first identified users of the walkway by their socio-economic characteristics and other factors important to their knowledge and use of the river. The second was a survey of businesses in the central business district, their economic characteristics, their relation to the river walkway, and the portion of gross receipts of these businesses attributable to the developed river area. The third survey identified characteristics of San Antonio residents, their knowledge of the river walkway, and their use of it.

146. Waller, Louis R., and Dwight R. McCurdy. 1977. A model for establishing water quality standards for rivers. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 380-385. North Cent. For. Exp. Stn., St. Paul, Minnesota.

An approach is presented for setting water quality standards for a river based on the following functional relation: R = f (Q, €Q, S, RC). Where R = recreation activities (in number of units), Q = water quality level, CQ = cost of achieving or maintaining a specific water quality level, S = recreational supply of the resource, and RC = recreational consumption. The approach is based on the assumption that the recreational use of a river is the most demanding of a high water quality compared to the other uses of the river.

147. Walsh, Richard G. 1977. Recreational user benefits from water quality improvement. *In* Economics of outdoor recreation Symp. Proc. USDA For. Serv. Gen. Tech. Rep. WO-2, p. 121-132. Northeast. For. Exp. Stn., Upper Darby, Pennsylvania.

Theorizes that upgrading the polluted waterways in the United States would result in a $7.3 billion increase in recreation users benefits (fishing, boating, swimming). Roughly $4.3 billion of this would be a savings in travel and time costs. Estimates do not include activities of youths 12 and under because of incomplete data concerning their water-based activities. Suggests further study on younger age groups. Also suggests research on benefits of incremental water quality improvement to determine what increase of benefits would result from a certain degree of water quality improvement.

(Also see reference numbers 12, 17, 29, 35, 40, 84, 102, 147)

148. Aitchison, Stewart. 1976. Human impact on the Grand Canyon. Down River 3(4):18-19.

Documents increasing use of the Colorado River through Grand Canyon National Park for river running and resulting biological and sociological problems. Outlines a recent National Park Service research project to determine carrying capacities and the effect of the Glen Canyon Dam on the riparian environment. Suggests restrictive management of biologically sensitive areas within the Canyon as an alternative to limiting total numbers of rafters.

149. Aitchison, Stewart W., Steven W. Carothers, and R. Roy Johnson. 1977. Some ecological considerations associated with river recreation management. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 222-225. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Drawing from an ecological study on the Colorado River, four river recreation management concerns are discussed: (1) river research versus river management--their interrelations and priorities, (2) extensive resource inventories--their role as indicators of environmental deterioration, (3) human impact--its identification and proposed mitigation, and (4) suggested guidelines for identifying unique and ecologically sensitive areas. Also discussed are other environmental degradents not directly associated with human impact, but nevertheless a source of concern for river managers, such as habitat destruction by wild burros.

150. Barton, Michael A. 1969. Water Pollution in remote recreational areas. J. Soil and Water Conserv. 24(4):132-134.

The concentrated use of remote recreation areas, such as Minnesota's Boundary Waters Canoe Area, threatens water quality. Solid wastes, enriched waters from adjacent municipalities, human waste, gasoline from outboard engines, and insecticides all contribute to a potentially serious pollution problem. Natural inputs, such as sedimentation, must also be considered. Proposes a system for monitoring selected constituents (e.g., phosphorus, fecal coliform, etc.).

151. Cain, Stanley A. 1968. Ecological impacts on water resources development. Water Resour. Bull. 4(1):57-74.

Cites the historic lack of concern for the ecological side effects in water resources development and the resulting damage to the environment. Describes physical, biotic, and abiotic factors of aquatic ecosystems that are easily disturbed by man's alterations. Recommends funding of future baseline ecological studies.

152. Craig, William S. 1977. Reducing impacts from river recreation users. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 155-162. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Dramatic increases in river recreation use make it mandatory for managers to utilize the latest knowledge for preventing site degradation and maintaining a desired experience. Suggests that such innovative management as scheduling use, hardening sites, and improving human waste disposal, can make it possible for a Wild and Scenic River Area to support more people without lowering the visitor's experience or the environmental quality.

153. Davis, John H. (ed.). 1977. The big clean up: a special feature section. Parks and Recreation 12(2):4a-40a.

Entire section devoted to the implications of the Federal Water Pollution Control Act Amendments of 1972 to parks, recreation, and the leisure services delivery system.

154. Ditton, Robert B., David J. Schmidly, William J. Boeer, and Alan R. Graefe. 1977. A survey and analysis of recreational and livestock impact on the riparian zone of the Rio Grande in Big Bend National Park. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 256-266. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Visitor use patterns, biological conditions, and selected items of recreational impact (including litter, trampling, tree cutting, and human waste) were measured for 12 months. Use and impact were shown to be strongly and positively correlated. However, recreational impact was not significantly related to the biological "health" of the area. Cluster analysis was used to group areas into three categories based on degree of impact; only one of every four sites was heavily impacted. Principal component analysis identified human impact features as best discriminators between sites.

155. Dolan, Robert, Alan Howard, and Arthur Gallenson. 1974. Man's impact on the Colorado River in the Grand Canyon. Am. Sci. 62(4):392-401.

Describes environmental changes that have occurred along the Colorado River through Grand Canyon National Park, Arizona, since the Glen Canyon Dam was constructed. Cites major impact the dam has had on water level fluctuations and the subsequent effects this change has had on the vegetation, fish, beach formation, and rapids along the river. Also notes the increased effect of human use on the ecology of the Canyon. Suggests that quantification of river trip activity is needed to cope with human impact in the canyon/river environment.

156. Hansen, Edward A. 1975. Does canoeing increase stream bank erosion? USDA For. Serv. Res. Note NC-186, 4 p. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Describes research on the Pine River in Michigan to determine if large increases in canoeing accelerated stream bank erosion. Most erosion was natural, but people sliding and camping on stream banks created some erosion. Heavy canoe traffic is not a causal factor in erosion.

157. James, George A. 1974. Physical site management. *In* Outdoor recreation research: applying the results. Papers from a workshop held by the USDA Forest Service at Marquette, Michigan, June 19-21, 1973. p. 67-82. USDA For. Serv. Gen. Tech. Rep. NC-9, 113 p. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Notes that much information is available about the protection and maintenance of recreation sites, but the large number of resource variables and the highly specific nature of many research findings make it difficult to condense this information into a compendium of site management guidelines. Maximum use is apparently not being made of available site management information. Reasons include the highly scattered nature of information, difficulty in obtaining pertinent material, and research findings not always directly applicable to the problem at hand. A suggested reading list with 60 annotated articles on the subject is presented.

158. Kalnicky, Richard A. 1976. Recreation use of small streams in Wisconsin. Dep. Nat. Resour., Tech. Bull. 95, 20 p. Madison, Wisconsin.

A field survey of 80 small stream reaches was conducted to determine the amount of recreational use of small streams in Wisconsin. Both streams affected and those not affected by wastewater discharge were surveyed. The data suggest that there is only one-fourth to one-half as much recreational use on discharge-affected streams as on nonaffected streams. Study concludes that discharges from wastewater treatment plants apparently degrade the water quality on many small streams in a way that is noticeable to recreational users.

159. Knudsen, A. B., R. Johnson, K. Johnson, and N. R. Henderson. 1977. A bacteriological analysis of portable toilet effluent at selected beaches along the Colorado River, Grand Canyon National Park, Arizona. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 290-295. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Portable toilet effluent buried at nine beaches along the Colorado River in Grand Canyon National Park was examined for bacteria. Viable total and fecal coliforms were isolated 84 percent of the time. Coliforms were present throughout the strata to a depth of 2 feet. Concludes there is a definite public health hazard because of the numbers of coliforms and associated pathogens that are capable of surviving from one season to the next. Therefore, the health of the 15,000 individuals who annually make Colorado river trips and camp at such beaches is potentially endangered.

160. Kusler, Jon A. 1973. Carrying capacity controls for water recreation uses. Wisconsin Law Rev. 1:1-36.

Defines sociological and ecological carrying capacity and discusses possible methods to limit use: water-surface and shoreline zoning, permits, commercial restrictions, and access controls. Discusses legal considerations of the above controls and cites past litigation regarding riparian versus public rights. Presents a model statute designed to strengthen water and shoreland planning in Wisconsin.

161. Merriam, L. C., Jr., C. K. Smith, D. E. Miller, Ching tiao Huang, J. C. Tappeiner, II, K. Goeckermann, J. A. Bloemendal, and T. M. Costello. 1973. Newly developed campsites in the Boundary Waters Canoe Area. Univ. Minnesota Agric. Exp. Stn., Bull. 511, For. Ser. 14, 27 p. St. Paul, Minnesota.

Thirty-three wilderness campsites developed in the Boundary Waters Canoe Area during 1967 by the Forest Service were studied for 5 years (1968-1972) to determine the impact of visitor use. The effects on soils, vegetation, and site size were measured twice each year. Impacts were most severe in aspen-birch cover types and least severe in the white-cedar type. Impacts leveled off before the end of 5 years. Implications for wilderness management are also discussed.

162. Merriam, L. C., Jr., and C. K. Smith. 1974. Visitor impact on newly developed campsites in the Boundary Waters Canoe Area. J. For. 72(10):627-630.

The impact of visitor use on newly developed campsites tended to level off after the first 2 years. Visitor registration provided nearly complete use data, and the effects on soil, water quality, vegetation, and site size were measured and mapped. Physical measurements were combined into an impact-stage rating system by cover types. Management implications of the results are discussed.

163. Muratori, Alex, Jr. 1968. How outboards contribute to water pollution. The Conservationist 22(6):6-8, 34.

Discusses the design of two-cylinder engines and reasons for the large amount of exhaust produced. Presents new techniques to control pollution from outboard motors.

164. Schmidly, David J., and Robert B. Ditton. 1976. A survey and analysis of recreational and livestock impacts on the riparian zone of the Rio Grande in Big Bend National Park. 160 p. Dep. of Wildl. and Fish. Sci. and Dep. of Recreation and Parks. Texas A&M Univ., College Station, Texas.

Reports the results of a study conducted on the Rio Grande in Big Bend National Park. Study was organized into four parts: (1) visitor useage analysis; (2) subjective site evaluation; (3) biotic communities analysis; and (4) photographic recordings. Based on information uncovered in the study, recommendations are made for establishing a management framework. Various management strategies are also presented.

165. Settergren, Carl D. 1977. Impacts of river recreation use on streambank soils and vegetation--state-of-the-knowledge. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 55-59. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Various means of assessing recreational impacts on stream-side soils and vegetation have been employed to provide data to support and implement management decisions. Believes that past research in this area has usually been confounded by several problems. Suggests that the most critical research needs are: (1) selecting sampling points or sites to yield impact data representing an entire riverway; (2) randomly locating plots, points, and transects within a selected area; (3) locating suitable before-and-after or used-and-unused sites for control; (4) selecting and measuring the most important and most user-sensitive soil and vegetation features; and (5) measuring visitor use and how it correlates with impact data.

166. Stewart, Ronald H., and H. H. Howard. 1968. Water pollution by outboard motors. The Conservationist 22(6):6-8, 31.

Oil contamination is widespread and detrimental to water quality and marine life. A case study of outboard motor fuel pollution near a resort area is discussed. Estimates are made on the amount of fuel-pollution and its effect on the aquatic environment and on the continuing role of the area as a popular resort.

167. Tennant, Donald L. 1976. Instream flow regimens for fish, wildlife, recreation and related environmental resources. *In* Instream flow needs Symp. Proc. and Spec. Conf. Vol. II, May 3-6, 1976, Boise, Idaho, p. 359-373. Am. Fish. Soc., Bethesda, Maryland.

Describes a quick, easy method for determining flows to protect the aquatic resources in both warmwater and coldwater streams based on their average flow. Detailed field studies were conducted on 11 streams in 3 States between 1964 and 1974. This work involved physical, chemical, and biological analyses of 38 different flows at 58 cross-sections on 196 stream-miles, affecting both coldwater and warmwater fisheries. The studies reveal that the condition of the aquatic habitat is remarkably similar on most of the streams carrying the same portion of the average flow.

(Also see reference numbers 12, 13, 14, 17, 27, 29, 30, 32, 35, 36, 37, 38, 40, 48, 50, 54, 72, 74, 81, 82, 83, 84, 90, 110, 111, 112, 113, 114, 123, 127, 132, 138, 139, 140, 143, 145, 147, 158, 164)

168. Ashton, Peter G., and Michael Chubb. 1972. A preliminary study for evaluating the capacity of waters for recreational boating. Water Resour. Bull. 8(3):571-577.

To determine the mathematical relation between use levels and user satisfaction, the quality of recreation experiences were examined for two groups of lake users in southeastern Michigan. Carrying capacity limits for boating were established, based on mailed questionnaires, personal interviews, and aerial photographs. Satisfaction was as important a variable in setting use limits as was the actual space available.

169. Barker, Mary L. 1968. The perception of water quality as a factor in consumer attitudes and space preferences in outdoor recreation. Assoc. Am. Geogr. Annu. Meet., Washington, D.C. (Mimeo)

Attempts to measure some of the social consequences of deteriorating water quality and the attitudes of people toward the recreational use of public waterways. Examines the relation between water quality evaluation and variables such as recreational activity, personal experience, and attitude toward the environment.

170. Baron, Norman J. E., James Cecil, and Philip L. Tideman. 1972. A survey of attitudes towards the Mississippi River as a total resource in Minnesota. Water Resour. Res. Cent. Bull. 55, 160 p. Univ. Minnesota, Minneapolis, Minnesota.

A survey of Minnesotan attitudes toward the use of the Mississippi River in Minnesota was conducted in 1971. Significant findings are that Minnesotans do not desire to curtail their uses of energy to improve the River's environmental quality, and that perceived present uses of the River are opposite to the uses of what the public desires.

171. Bassett, John R., Beverly L. Driver, and Richard M. Schreyer. 1972. User study: characteristics and attitudes Michigan's AuSable River. 78 p. Sch. Nat. Resour., Univ. Michigan, Ann Arbor, Michigan.

Discusses physical attributes of the AuSable River, biological impacts from human use, and economic impacts on the area from tourism. A survey of river users was conducted to determine user characteristics, conflicts among users, and other problems of use.

172. Boster, Mark A. 1972. Colorado River trips within the Grand Canyon National Park and Monument: a socio-economic analysis. Dep. Hydrol. Water Resour. Rep. 10, 83 p. Univ. Arizona, Tucson, Arizona.

Surveys river runners on the Colorado River through the Grand Canyon in Arizona to establish a social carrying capacity. Includes socio-economic information about users; user motives, expectations, perceptions, and satisfaction; and perceptions of river managers.

173. Boster, M. A., R. L. Gum, and D. E. Monarchi. 1973. A socio-economic analysis of Colorado River trips with policy implications. J. Trav. Res. 12(1):7-10.

Summarizes a study on the perceptions, expectations, and interactions of recreation users on the Colorado River through Grand Canyon National Park, Arizona. Suggests using both physical and biological factors to determine human carrying capacity of the Colorado River.

174. Branch, James R., and Stephen C. Fay. 1977. Recreation management planning for a multi-use scenic river corridor. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 142-146. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Thirteen Mile Woods is a highly scenic strip of forest land along the northern reaches of the Androscoggin River in New Hampshire. A survey of its visitors--canoeists, kayakers, picnickers, campers, fishermen, and snowmobilers--indicated their desire to maintain the area in its undeveloped condition. Land capability and administrative viewpoints indicated the same minimum development. Design capacity is discussed as a management concept for this land and river corridor.

175. Brewer, Durward, and Glenn A. Gillespie. 1969. Socioeconomic factors affecting participation in water-oriented outdoor recreation. USDA Econ. Res. Serv. ERS-403, 37 p. Washington, D.C.

Demand for water-oriented recreation by metropolitan populations can be estimated by assessing socioeconomic characteristics such as income, education, sex, race, occupation, and amount of leisure time. Results from a questionnaire given to St. Louis, Missouri, residents indicate that families with white male heads of households engaged in more outdoor recreation than families headed by nonwhites and women; demand for outdoor activities decreases with age; and higher income groups have more leisure time, more opportunities for recreation, and travel farther from home for outdoor recreation than do lower income groups.

176. Brickler, Stanley K., Douglas K. Larson, and Robert C. Johnson. 1974. Social carrying capacity of Grand Canyon Colorado River float trips: a conceptual framework. Inst. Renewable Nat. Resour. 40 p. Univ. Arizona, Tucson, Arizona.

Develops a three-phase conceptual framework for understanding and measuring aspects of social carrying capacity. Pretrip phase includes study of trip activity profiles, participant profiles, and user motivations. On-site phase includes study of actual float-trip where the individual encounters physical and perceptual sensations and experiences. Post-trip phase involves study of an individuals recollections about the float trip.

177. Brown, T. L., and G. R. Reetz. 1976. Swimming participation and water quality in Tompkins County, New York. Completion Rep., 53 p. Dep. Nat. Resour., Cornell Univ., Ithaca, New York.

A sample of Tompkins County households were surveyed to determine: (1) frequency of swimming, (2) frequency residents swim in waters not approved for swimming, (3) degree of public understanding and agreement with existing swimming standards, and (4) degree to which swimming is affected by perceptions of water quality. Findings indicate that most of Tompkins County's outdoor swimming occurs in natural area streams that are not regularly monitored by the local health department for water quality. Further, the majority of respondents could not give an evaluation on the degree of strictness of existing standards for swimming. Attitudes toward water quality appear to have some influence on swimming and the choice of a swimming area but other considerations such as convenience were more important.

178. Bryan, Hobson. 1977. Leisure value systems and recreational specialization: the case of trout fishermen. J. Leisure Res. 9(2):174-187.

A conceptual framework of trout fishermen is developed around the concept "recreational specialization". This refers to a continuum of behavior from the general to the specialized. It is reflected by equipment, skills used, and preferences for specific recreation setting.

179. Carlson, John E. 1974. Attitudes of Idaho residents toward free flowing rivers as a water use in Idaho. Scenic Rivers Study Rep. 12, 59 p. Water Resour. Res. Inst., Univ. Idaho, Moscow, Idaho.

Survey of Idaho residents to: (1) identify the importance of natural resources compared to other issues (e.g., education) and (2) identify the importance of wild rivers as a water use. Concludes that major resource priorities were in the areas of utilization and preservation and that Idahoans should approach resource use from a balanced perspective. The controversial area of wild and scenic river classification was supported even though attitudes were somewhat polarized. Suggests that attitudes should not be taken at face value alone but evaluated with respect to a person's overall priority rankings of various resource uses.

180. Christopherson, Kjell Arne. 1972. Report of an analysis of attitudes and opinions of St. Joe River basin landowners toward wild and scenic rivers. Scenic Rivers Study Rep. 2, 74 p. Water Resour. Res. Inst., Univ. Idaho, Moscow, Idaho.

Presents results of a survey of St. Joe River basin landowners on their attitudes and opinions towards the proposed inclusion of the St. Joe River in the National Wild and Scenic River System. Ascertains landowner/recreationist conflicts and the extent to which landowner's management policies and practices will be affected by such conflicts. Concludes that increasing public recreation facilities will substantially reduce such conflicts. Encourages active participation by private landowners in decision-making processes.

181. Christopherson, Kjell Arne. 1973. Attitudes and opinions of recreationists toward wild and scenic rivers: a case study of the St. Joe River. Scenic Rivers Study Rep. 9, 66 p. Water Resour. Res. Inst., Univ. Idaho, Moscow, Idaho.

Presents results of interviews with St. Joe River recreation users in 1971-1972. Focuses on the users attitudes and opinions toward the river's inclusion in the National Wild and Scenic River System. Responses favored river designation but concern was expressed for the intensity of development and recreational use the river might receive if designated.

182. Chubb, Michael, and Holly R. Chubb. 1975. 1974 Michigan recreational boating study. Recreation Resour. Consultants Rep. 4, 103 p. East Lansing, Michigan.

Presents results of a 1974 study on the amount, type, and pattern of use of licensed Michigan watercraft. Discusses and evaluates 19 factors that affect the reliability of the data and recommends how data collection can be improved for future studies.

183. Cieslinski, Thomas J. 1977. Allagash wilderness waterway. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 117-120. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Describes problems, solutions, and use experience during the first 10 years of managing the Allagash wilderness waterway. Problems related to increasing use include establishing public routes of access, registering users, dispersing users along the route of travel, restricting group sizes, establishing total use limits, and disposing of litter.

184. Clark, Roger N. 1977. Alternative strategies for studying river recreationists. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 91-100. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Recreation researchers have a variety of social research tools available to them. Often, however, the application of alternative tools in studying recreation issues is inconsistent with the strengths and weaknesses of the procedures. Alternative research strategies are discussed in terms of their ability to provide information to answer basic questions about recreation users and recreation problems. Implications for planners, managers, and policy-makers are addressed.

185. Cordell, Harold K., Gordon A. Hammon, John Graham, William L. Hafley, and M. Roger Warren. 1975. Capacity of water-based recreation systems Part III: methodology and findings. Water Resour. Res. Inst. Rep. 90, 109 p. North Carolina State Univ., Raleigh, North Carolina.

Develops methods, models, and guidelines for planning and managing water-based recreation sites. Presents methods for collecting and processing data on the recreational behavior of boaters. Finds that capacity, measured as the number of boats on the lake system at the same time, is not a fixed number because most users seem to acclimate themselves to heavy use periods.

186. Driver, B. L., and John R. Bassett. 1975. Defining conflicts among river users: a case study of Michigan AuSable River. Naturalist 26(1):19-23.

Summarizes the findings of a 1971 Michigan study that examined the characteristics and attitudes of the river users (canoeists, fishermen, canoe outfitters, and cottage residents). Identifies primary areas of conflict as: (1) number and distribution of users, (2) motives of users, (3) user's perceptions of managerial problems, and (4) user reaction to controls on river use.

187. Driver, B. L., and John R. Bassett. 1977. Problems of defining and measuring the preferences of river recreationists. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 267-272. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Discusses seven broad types of problems experienced while researching the preferences of recreationists on three rivers in Michigan. Those problem areas concerned the tasks of: (1) selecting variables to be included in research designs; (2) deciding which research approach is best suited for particular purposes; (3) designing sample plans; (4) collecting data in the field; (5) understanding the dynamics of human preference formation; (6) defining the word preference; and (7) specifying clearly the preferences to be studied. Recommendations are offered for helping solve these problems.

188. Driver, B. L., and R. C. Knopf. 1976. Temporary escape: one product of sport fisheries management. Fisheries 1(2):21, 24-29.

Cites data from several studies to support the hypothesis that sport fishing helps people escape from stress experienced in home, neighborhood, and work environments. States that there are strong indications that stress levels within many individuals are increasing and that sport fishing is one way to relieve stress. Feels that more research into the value of sport fishing as a stress-relieving recreational activity is needed to enable managers of sport fisheries to better provide opportunities for this recreational activity.

189. Field, Donald R., and Neil H. Cheek, Jr. 1974. A basis for assessing differential participation in water based recreation. Water Resour. Bull. 10(6):1218-1227.

Data from telephone interviews of adult residents in western Washington, western Oregon, and northern California and data collected by observing recreationists using the coastal beaches of Olympic National Park, Washington, were used to identify factors associated with different participation patterns among recreation user populations. Comparison of these data suggests that recreation sites are perceived as leisure settings by both individuals and groups, and in that context possess a larger socio-cultural meaning than their strictly designed intent.

190. Gaumnitz, Jack E., Robert L. Smith, and John O. Tollefson. 1973. Simulation of water recreation users' decisions. Land Econ. 49(3):269-277.

Assumes that individuals have patterns of behavior that they consistently follow when making decisions about the kinds of recreation facilities to use and types of recreational activities to engage in while at a recreation site. Based on this assumption a simulation model was developed to reproduce the same behavior as an individual when given the same types of choices and decisions to make about the recreational sites. The model was designed with the same mechanisms individuals use to make decisions: memory, memory search, selection procedures, and a set of decision rules. These patterns of behavior can provide managers with a powerful tool to analyze choices and preferences of a population for predicting use rates at water recreation facilities.

191. Gillespie, Glenn A., and Durward Brewer. 1969. An econometric model for predicting water-oriented outdoor recreation demand. USDA Econ. Res. Serv. 402, 15 p. Washington, D.C.

Develops and tests an econometric model to estimate future demand at water recreation sites (lakes and streams). To test the model, 1,000 families living in St. Louis, Missouri, were randomly selected and surveyed in 1964. The model correlates socio-economic characteristics of survey group with water-oriented outdoor recreation activities such as swimming, fishing, boating, and water-skiing. Concludes income, age, sex, education, and occupation affect an individual's level of recreation participation and types of recreational activities pursued.

192. Godfrey, E. Bruce, and Robert L. Peckfelder. 1972. Recreation carrying capacity and wild rivers: a case study of the Middle Fork of the Salmon River. West Agric. Econ. Assoc. Proc. 45, p. 353-363. Logan, Utah.

Based on a 1971 study of use and users on the Salmon Middle Fork, three major factors were identified as necessary considerations for determining the River's recreational carrying capacity: (1) Legislation--the Wild and Scenic Rivers Act and the Wilderness Act provide administrators with general guidelines. (2) Environmental concerns--recreationists have negative impacts on the flora and fauna of the River environment. (3) User desires--major reasons given by recreationists for floating the River were solitude, scenic attractions, primitive atmosphere, and white water adventure.

193. Gordon, Douglas. 1971. A preliminary socio-economic analysis of hunting in Salmon River Basin: a methodology study to develop evaluation criteria for wild and scenic rivers. 44 p. Water Resour. Res. Inst., Univ. Idaho, Moscow, Idaho.

Sociological data and management-oriented information was collected from hunters in the Salmon River Basin during the 1969 hunting season. Expenditures associated with hunting were assessed. Hunter behavior, preferences, opinions, and place of residence were determined. Concludes that hunter expenditures associated with the wildlife resources are vital to the economy of the Salmon River Basin. Any development affecting wildlife resources--providing new access roads, improving existing roads, building more campgrounds and related facilities, or allowing more outfitters and guides--would have a negative economic impact on the Basin.

194. Graefe, Alan R. 1977. Elements of motivation and satisfaction in the float trip experience in Big Bend National Park. M.S. thesis. Dep. of Recreation and Parks, Texas A&M Univ., College Station, Texas. 170 p.

Presents results of a study of 329 river floaters on the Rio Grande in Big Bend National Park to determine the inter-relation between motivations and satisfaction in a float trip experience. Describes the most important motivations as: enjoyment, learning about nature, stress release/solitude, intra-group affiliation, challenge/adventure/achievement/photography/autonomy, extra-group affiliation, self-awareness and status. Measures of satisfaction were obtained by comparing importance and performance ratings for each motive. Concludes that Rio Grande float trips are perceived differently by different individuals and are capable of providing a variety of types of float trip experiences.

195. Gunn, Clare A., David J. Reed, and Robert E. Couch. 1972. Cultural benefits from metropolitan river recreation San Antonio prototype. Texas Water Resour. Inst., Tech. Rep. 43, 116 p. Texas A&M Univ., College Station, Texas.

Reports the responses of visitors, developers, and the voters of San Antonio to a recreation-business development complex along the San Antonio River in downtown San Antonio, Texas. Visitors describe the river-oriented development as beautiful, uncrowded, safe, and non-commercial. They claim it offers opportunities for a variety of leisure pursuits such as solitude, excitement, and sightseeing. Developers see the development as an informally designed landscape with provisions for many activities (business and recreation). Voters feel the development is a tourist attraction, is safe and clean, and they favor expanding the river development even if taxes would have to be raised to help pay for it.

196. Heberlein, Thomas A. 1977. Density, crowding, and satisfaction: sociological studies for determining carrying capacities. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 67-76. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Four types of carrying capacity are identified: physical, ecological, facilities, and social. The importance of both levels of technology and value judgments are noted for determining any of these capacities. The satisfaction model based on an explicit or implicit adoption of economic theory by both researchers and managers for determining social carrying capacity is lacking and an alternative model based on a determination of social norms is proposed. This model is discussed both in terms of recent social psychological studies of crowding as well as prior assessments of recreation carrying capacity. Finally, some practical suggestions for adopting this model are noted.

197. Heberlein, Thomas A., and Jerry J. Vaske. 1977. Crowding and visitor conflict on the Bois Brule River. Tech. Rep. WIS--WRC-77-04, 100 p. Univ. Wisconsin, Madison, Wisconsin.

Nearly 3,000 canoers, tubers, and fishermen were interviewed as they left the Upper Bois Brule River in the late summer of 1975 to determine their perceptions of crowding, satisfaction, and reported contacts with other visitors. In spite of daily use levels that were as high as 308 visitors on a 10-mile stretch, there was no relation between use levels and satisfaction. This study replicates prior research by Nielson and Shelby on Colorado River visitors, and casts more doubt on an econometric model of carrying capacity based on an assumed relation between use level and satisfaction of river users. All visitor groups expressed similar motivations for their visits, such as being close to nature, but differed in their level of commitment and background.

198. Howard, Gordon, John Bethea, Jr., Dee Kiger, and Rebecca Richardson. 1976. Chattooga River visitor survey. 75 p. Dep. Recreation and Park Administration. Coll. For. and Recreation Resour. Clemson Univ., Clemson, South Carolina.

Study about private and commercial users of the Chattooga River to develop: (1) a demographic profile of on-the-water-users, (2) a profile of water recreation users expectations, (3) a profile on users reactions to management options, and (4) a profile on users perception of river congestion. Study found that there is a difference between commercial and private users and their views toward management options. Commercial users rejected 8 out of 13 but private users rejected 15 out of 21 proposed management options and showed no majority concurrence on the remaining six. This difference may be accounted for partially because commercial users show their willingness to be managed by electing to use a commercial service.

199. James, George A., H. Peter Winkle, and James D. Griggs. 1971. Estimating recreation use on large bodies of water. USDA For. Serv. Res. Pap. SE-79, 7 p. Southeast. For. Exp. Stn., Asheville, North Carolina.

Describes a pilot sampling technique, originally tested on East Lake and Paulina Lake in Oregon in 1968, for estimating recreational use on large bodies of water. Includes recommendations for future sampling. Sampling technique included both ground observation and aerial counts of boats on the Lakes. Technique has application to measuring recreational use on rivers.

200. James, George A., Nelson W. Taylor, and Melvin L. Hopkins. 1971. Estimating recreational use of a unique trout stream in the coastal plains of South Carolina. USDA For. Serv. Res. Note SE-159, 1 p. Southeast. For. Exp. Stn., Asheville, North Carolina.

Presents results of a study conducted to estimate fishing use on a small trout stream in South Carolina. Simple random sample estimation procedures were tested and information was obtained for further refinement in use and cost estimation for trout fishing. Use was highly localized and only small costs were involved for fishing. Recreation and intangible benefits outweighed economic expenditures by fishermen.

201. Kaplan, Rachel. 1977. Down by the riverside: informational factors in waterscape preference. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 285-289. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Suggests that people like rivers and riversides because they provide both a sense of orderliness and a sense of involvement and mystery. The recreation value of rivers extends far beyond fishermen, boaters, and other traditional users. Even unspectacular rivers provide a source of enjoyment and tranquility for many who use only the riverbank, view the river from afar, or who only know that it is "there" and available. Stresses that because these passive users experience benefits similar to active users, their requirements deserve attention in design and management decisions. Suggests that ways must be found to involve passive users in decision-making so their diverse needs and concerns will not be overlooked.

202. Knopf, Richard C., B. L. Driver, and John R. Bassett. 1973. Motivations for fishing. *In* 38th North American wildlife and natural resources Conf. Trans. p. 191-204. March 18-21, 1973. Washington, D.C. Published by Wildlife Management Institute.

Discusses why people fish and engage in other recreation activities. Proposes that recreation management problems should be approached from a behavioral point of view. Identifies important forces that influence how people spend their leisure time and discusses progress in developing techniques for identifying and measuring recreational motives relevant to managers. Illustrates the use of these techniques to learn what motivates select groups of fishermen in Michigan. Concludes that increasing numbers of outdoor recreationists are using natural areas to temporarily resolve problems experienced at home and that serious consideration should be given to the degree to which opportunities should be provided in resolving these problems.

203. Lee, John. 1975. Collection and analysis of visitor use information: proposed upper Missouri wild and scenic river. 32 p. West. Interstate Comm. Higher Educ. and Dep. Recreation Park Manage. Univ. Oregon, Eugene, Oregon.

Presents data on visitor use from a 1975 study on the upper Missouri River by the Bureau of Land Management. Describes patterns of visitor use and develops user profiles based on socio-economic characteristics. Makes suggestions on regulating river use and provides guidelines to develop an informational guide for river floaters.

204. Lime, David W. 1971. Factors influencing campground use in the Superior National Forest of Minnesota. USDA For. Serv. Res. Pap. NC-60, 18 p. North Cent. For. Exp. Stn., St. Paul, Minnesota.

From a study of campground use in 1967 and 1968, relations were determined between the intensity of use and 74 site and location characteristics. Campers were interviewed to learn what factors influenced their choice of a particular campground. Outlines recommendations to managers and discusses topics for further research.

205. Lime, David W. 1972. Large groups in the Boundary Waters Canoe Area--their numbers, characteristics, and impact. USDA For. Serv. Res. Note NC-142, 4p. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Discusses the impact of "large" parties in the BWCA in terms of their effect on the resource and on the experience of other visitors. Describes the amount of use by large groups and the visitors most likely to be affected by various party size limitations.

206. Lime, David W. 1975. Sources of congestion and visitor dissatisfaction in the Boundary Waters Canoe Area. *In* Quetico-Superior Foundation 1975 Institute on the Boundary Waters Canoe Area Proc. p. 68-82. May 9, 1975, Duluth, Minnesota. Quetico-Superior Foundation, Minneapolis, Minnesota.

Summarizes trends in visitor use since the advent of the Wilderness Permit in 1966. Also reviews a 1971 study of visitor attitudes and perceptions of crowding. Concludes that shifts in use suggest a greater significance of the Boundary Waters Canoe Area as a national wilderness resource. Discusses several management actions to reduce crowding.

207. Lucas, Robert C. 1964. The recreational capacity of the Quetico-Superior area. USDA For. Serv. Res. Pap. LS-15, 34 p. Lake States For. Exp. Stn., St. Paul, Minnesota.

Visitor use of wilderness continues to grow each year, raising the question of recreational capacity and what are acceptable limits of use. Wilderness qualities were the main attraction for canoe trippers; other visitors considered fishing or scenery primary. Canoeists saw the wilderness as smaller than other visitors. Canoeists also felt the wilderness was overcrowded at lower levels of use and objected strongly to motorboats. A method for measuring capacity indicated total use is close to capacity, but more area is underused than overused. Use projections point to severe overuse. Implications for zoning and visitor regulations are discussed.

208. Lucas, Robert C. 1964. Wilderness perception and use: the example of the Boundary Waters Canoe Area. Nat. Resour. J. 3(3):394-411.

Examines the perception of wilderness by visitors to Minnesota's Boundary Waters Canoe Area. Discusses conflicts between user groups and between management policies and visitors. Compares perceptions of wilderness held by resource managers and various user groups. Outlines possible management alternatives for this area and similar wildland settings.

209. Lucas, Robert C. 1970. User evaluation of campgrounds on two Michigan national forests. USDA For. Serv. Res. Pap. NC-44, 15 p. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Campground use on the Huron and Manistee National Forests was studied in relation to resource characteristics, location, facilities provided, and visitor attitudes about the environment. Applies regression analysis to explain variation in campground use per unit. Compares visitor ratings of quality to nationwide Forest Service recreation resource inventories.

210. Maine Department of Conservation, Bureau of Parks and Recreation. 1974. 1973 survey of Allagash Wilderness Waterway visitor use and visitor use characteristics. 64 p. Augusta, Maine.

Presents results of surveys conducted in 1967 and 1972 of use on Maine's Allagash Wilderness Waterway. Data were collected on patterns of use and characteristics and motives of river users. Presents trends in visitor use since 1966. Concludes that because of congestion and user conflicts, efforts should be made to: (1) redistribute use over time and space, (2) separate small and large groups, and (3) develop separate sites for vehicle camping and picnicking from river floaters.

211. Matzat, Howard, John Benedict, and Dennis Myers. 1974. Land management report of users along the Stanislaus, Mokelumne, and Merced Rivers, during 1974. 27 p. Bur. Land Manage., Folsom Dist., Folsom, California.

Reports results of a 1974 spring survey of recreation use on the Stanislaus, Mokelumne, and Merced Rivers of California. Also presents a method for collecting future recreation use data.

212. McCool, Stephen F. 1972. Concept plan recommendations: Apple River recreation area. Tech. Rep. 1, 12 p. Univ. Wisconsin, River Falls, Wisconsin.

Describes tubing activities and high-density use on the Apple River near Somerset, Wisconsin. In 1971, an estimated 5,000 persons per hour floated on inner tubes down a short stretch of the Apple River. Concludes current overuse requires user control and management. Delineates a means of correcting the overuse problem through a method of self-management by the users.

213. McCool, Stephen F., and Lawrence C. Merriam, Jr. 1970. Factors associated with littering in the Boundary Waters Canoe Area. Minnesota For. Res. Note 218, 4 p. Sch. For., Univ. Minnesota, St. Paul, Minnesota.

Defines those variables most meaningfully related to sensitivity about litter and compliance with littering regulations. Discusses the role of outfitters in communicating and reinforcing norms. Examines the need for managers to establish relations with nonoutfitted groups in order to gain compliance.

214. McCool, Stephen F., and Lawrence C. Merriam, Jr. 1970. Travel method preferences of BWCA campers. Minnesota For. Res. Note 219, 4 p. Sch. For., Univ. Minnesota, St. Paul, Minnesota.

Probes the extent to which canoeists and motor boaters are satisfied with their method of travel. Examines the reactions of people toward other travel methods and discusses future patterns of use and management implications.

215. McCool, Stephen F., and Lawrence C. Merriam, Jr. 1971. Camper-outfitter interaction and the Boundary Waters Canoe Area, Superior National Forest, Minnesota. Minnesota For. Res. Note 225, 4 p. Sch. For., Univ. Minnesota, St. Paul, Minnesota.

Focuses on describing the communication processes of outfitters and wilderness visitors. In particular, identifies visitors' information sources and levels of knowledge about the Area and their attitudes on several important management policy issues.

216. McCool, Stephen F., and S. M. Haydock. 1976. Hikers of the Virgin River Narrows, Zion National Park. Institute for the Study of Outdoor Recreation and Tourism. 80 p. Utah State Univ., Logan, Utah.

Presents results of a 1976 summer study of day users and campers hiking in the Narrows. Data were collected and analyzed on: (1) total recreational use of the area, (2) socio-demographic characteristics of users, (3) recreational activity patterns, and (4) perception of users to hazards in the Narrows. Results showed that campers in the Narrows tended to be former day users. Also, although more than half the users were aware of the severe flash flood hazard in the area during the summer months, they were unaware of the probability of such a flood occurring.

217. Merriam, L. C., Jr., and Timothy B. Knopp. 1977. The complex uses of an accessible river--the Kettle of Minnesota. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 312-319. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Minnesota's Kettle River provides a wide range of recreation attractions--whitewater kayaking, canoeing, fishing, and boating--within 100 miles of the Minneapolis-St. Paul metropolitan area. Initial results of a 1975-1976 study to develop baseline visitor data and a means of monitoring use suggest a complex of uses, visitor types, and river conditions.

218. Minnesota Outdoor Recreation Resources Commission. 1965. Recreational use of the St. Croix River. MORRC Study Rep. 11, 42 p. St. Paul, Minnesota.

A geographical and recreational description of the St. Croix watershed, including an inventory of recreation sites, general land uses, and ownership patterns is provided. Reviews laws and studies related to recreational use of the St. Croix. Presents selected recreation use statistics.

119. More, Thomas A., Robert O. Brush, and J. Alan Wagar. 1977. Variation and recreation quality in river management. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 329-333. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Suggests that variability in the river environment is a major determinant of the quality of river recreation experiences. Four main sources of variation exist for river canoeing: psycho-social, landscape, river, and the activity itself. By considering how these sources of variation interact, suggests that it should be possible to affect the quality of the recreation experience and accomplish other management objectives as well.

120. Munley, Vincent G., and V. Kerry Smith. 1976. Learning-by-doing and experience: the case of whitewater recreation. Land Econ. 52(4):545-553.

A household production model is used to show the impact of user experience on consumer behavior. Suggests that the more often an individual engages in an activity, such as whitewater boating, the more skilled the person becomes at the activity and the more demanding the person is of a recreational site's services. Concludes that as experience and skill increase, a positive effect on the person's willingness to pay is observed but tends to level off as the desired degree of skill is reached.

121. Nicolson, J. A., and A. C. Mace, Jr. 1975. Water quality perception by users: can it supplement objective water quality measures? Water Resour. Bull. 11(6):1197-1207.

Personal interviews were conducted with 80 campers in each of 3 Minnesota State Parks to find how users perceived the quality of the water. Water quality factors were measured or observed as an indication of conditions experienced by the recreation users. Results indicate most people perceive water pollution on a visual basis only. Most felt that recreational activity did not contribute to water pollution. Two-thirds of the respondents felt their water recreation was not curtailed by water pollution.

122. Nielsen, Joyce McCarl, Bo Shelby, and J. Eugene Haas. 1975. Sociological carrying capacity and the last settler syndrome. Colorado River Res. Ser. Contrib. 8, 24 p. Human Ecol. Res. Serv., Boulder, Colorado.

Reviews literature on social carrying capacity and concludes that problems exist when trying to quantify capacity. Suggests that traditional user satisfaction models are probably inadequate to explain social carrying capacity. First-time users to a recreational area may have one threshold for crowding whereas persons who have visited a site more than once probably have a different threshold for crowding.

123. Nielsen, Joyce McCarl, and Bo Shelby. 1977. River-running in the Grand Canyon: how much and what kind of use. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 178-182. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Management issues relating to amount and kind of river-running use on the Colorado River in the Grand Canyon were investigated in 1975. Results show that use levels affect number of inter-group contacts, but number of contacts has little effect on perceived crowding or user satisfaction. Describes probable effects of an increase in oar trips.

124. Peckfelder, Robert L. 1973. Wild river perception and management: a study of users and managers of the Middle Fork of the Salmon River. Scenic Rivers Study Rep. 8, 108 p. Water Resour. Inst., Univ. Idaho, Moscow, Idaho.

During the summer float season of 1971, questionnaires were administered about the perceptions river managers have concerning the characteristics and attitudes of river floaters and the perceptions, attitudes, and characteristics river floaters have about themselves and river management. Data analysis show that Middle Fork River managers are in tune with floaters on their personal outlook of river management but have a poor idea of floaters' personal characteristics. Significantly more floaters than managers felt solitude should be an important part of the river experience.

225. Peterson, George L. 1974. A comparison of the sentiments and perceptions of wilderness managers and canoeists in the Boundary Waters Canoe Area. J. Leisure Res. 6(3):194-206.

Wilderness managers and summer canoeists were studied to determine whether the two groups differ in their wilderness motivations, attitudes, preferences, and perceptions of the Boundary Waters Canoe Area. Study indicates that managers have more varied motivations and more knowledge about the Area. Canoeists have an inflated image of the wilderness character of the Area but are more demanding in their expectations and use different criteria to evaluate recreational performance. The managers seem to be more cautious and realistic and less romantic and fanciful than the canoeists in their preferences for wilderness activities. Concludes that because of these differences, management services will be less than optional if the manager's decisions reflect his own attitudes and perceptions.

226. Peterson, George L., and Edward S. Neumann. 1969. Modeling and predicting human response to the visual recreation environment. J. Leisure Res. 1(3):219-237.

A method to predict user preferences for the visual recreation environment is proposed. Quantitative preference functions that respond sensitively to individual differences and characteristics of the environment are developed.

227. Pfister, Robert E. 1977. Campsite choice behavior in the river setting: a pilot study on the Rogue River, Oregon. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 351-358. North Cent. For. Exp. Stn., St. Paul, Minnesota.

The relation of campsite choice to the natural characteristics of campsites was analyzed along the Rogue River in Oregon. Two regression models--for commercial and noncommercial camping parties--were formulated relating campsite choice to 13 site characteristics of river terraces. Of the five significant variables selected for each model, three were the same: size of the campsite, size of the tributary providing potable water to the location, and a rating of beach area available for landing a boat.

228. Pfister, Robert E., and Robert E. Frenkel. 1974. Field investigations of river use within the wild river area of the Rogue River, Oregon. Rogue River Study Rep. 1, 108 p. Dep. Geogr., Oregon. State Univ., Corvallis, Oregon.

Summarizes 1974 field survey to determine recreational carrying capacity and use levels along the federally designated wild area of the Rogue River. Revealed differences between commercial and noncommercial river travelers with respect to occupation, number of previous river trips, and membership in conservation organizations. Differences were also noted in commercial and noncommercial user's attitudes towards levels of crowding and potential use restrictions. River campsites were inventoried with respect to availability of potable water and enough flat ground to accommodate a camping party of four.

229. Recreation Resource Consultants. 1972. 1971 Michigan recreational boating study. Recreation Res. Consultants Rep. 2, 128 p. East Lansing, Michigan.

Presents results of the fourth Statewide boating survey. Questionnaires were used to obtain information on the amount, distribution, and nature of recreational boating by registered boaters in 1971. Estimates probable future boating use in Michigan and develops computer mapping techniques to show current and future distribution of boat use. Logistical problems of three previous Michigan boating studies are reviewed and recommendations are given on ways to improve future studies.

230. Reed, David J. 1976. The San Antonio River Walk: a user and environmental analysis. J. Soil Water Conserv. 31(1):28-30.

Reflects on the impact and effect of urban water development on users. Generally, user attitudes to urban river development are positive. Suggests diversity in design and development for success of urban river walkways.

231. Roggenbuck, Joseph W. 1975. Socio-psychological inputs into carrying capacity assessments for float-trip use of whitewater rivers in Dinosaur National Monument. 309 p. Ph.D. diss. Dep. For. and Outdoor Recreation, Utah State Univ., Logan, Utah.

Examines potential management strategies, perceptions of crowding, and sources of satisfaction for river users on the Green and Yampa Rivers in 1975. Different identifiable user groups varied in their responses to questions concerning recreational use of whitewater rivers as a function of differing expectations for the recreational experience.

232. Roggenbuck, Joseph W., and Richard M. Schreyer. 1977. Relations between river trip motives and perception of crowding, management preference, and experience satisfaction. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 359-364. North Cent. For. Exp. Stn., St. Paul, Minnesota.

River-floaters in Dinosaur National Monument were interviewed during the summer of 1975. Trip motives, in descending order of importance to users, were: action/excitement, learning about nature, stress release/solitude, affiliation, autonomy/achievement, self-awareness, and status. User scores on the motive-scales were related to user perceptions of river crowding, opinions on appropriate maximum group-size, campsite development strategies, river management techniques, and user satisfaction. A number of correlations were statistically significant, though relations tended to be weak. Management implications are also discussed.

233. Schafer, Thomas G. 1975. Management alternatives for the improvement of canoeing opportunities and the resolution of problems relating to the recreational use of rivers. Ohio Dep. Nat. Resour. Tech. Rep. 5, 181 p. Off. Plann. Res., Columbus, Ohio.

A three-phase study was conducted during 1974 in an effort to evaluate the needs and problems associated with canoeing in Ohio. The first phase was to gather information about other States' canoe programs to serve as a source of data on manager's viewpoints of how river recreation use and users should be managed. Phase two was to survey 1,000 Ohio canoe owners to identify their attitudes about management alternatives to problems of increased canoe use on Ohio's rivers. The final phase was to review and analyze phases one and two. Results of phase three identified the following alternatives to control use on the State's rivers: institute a permit system, increase the number of facilities and access points along some rivers, provide more campsites along rivers, and publish a "Guide to Ohio's Canoe Trails".

234. Schreyer, Richard. 1977. Satisfaction and user input to management. Utah Tourism and Recreation Rev. 6(1):1-7.

Proposes that the effectiveness of management decisions may be assessed by analyzing user input and scientific data. Defines recreation behavior and its main factors--past experience, expectations, and satisfaction. States that it is possible to associate recreational opportunities (canoeing, river running) with specific experiences (solitude, excitement) and that it is possible to manage for the experiences. Also includes results from a 1975 study on the Green and Yampa Rivers in Dinosaur National Park on recreation behavior and rivers.

235. Schreyer, Richard, Joseph W. Roggenbuck, Stephen F. McCool, Lawrence C. Royer, and Jay Miller. 1976. The Dinosaur whitewater river recreation study. 165 p. Institute for the Study of Outdoor Recreation and Tourism Dep. For. and Outdoor Recreation. Utah State Univ., Logan, Utah.

Reports the results of a 1975 study of users of the Green and Yampa Rivers in Dinosaur National Monument. Users were predominantly first time floaters and were overwhelmingly satisfied with the trip. Their most important expectations for the trip were found to be action/excitement, experiencing nature, and stress release/solitude. Recommends action managers can take to satisfy users but still minimize the effects of crowding and maintain a quality experience.

236. Seitz, William K., III. 1974. Patterns of recreational use and characteristics of users of the Upper Iowa River. Ph.D. diss. Iowa State Univ., Ames, Iowa. 193 p.

Examines recreational use on a 74-mile section of the Upper Iowa River in northern Iowa during 1972-1973. Data collected through personal interviews with river users and aerial counts were analyzed to identify the characteristics of users, use patterns, and user perceptions. Canoeing was the most popular and camping was the second most popular activity. Most canoeists used the river on weekends and holidays. Most users felt the river was becoming too crowded but wanted more facilities (campsites, tables, toilets, etc.) provided. Suggests that canoeing be dispersed more evenly to alleviate crowding.

237. Seitz, William K., and Robert B. Dahlgren. 1975. Water-based recreational use patterns of the Upper Iowa River. Iowa State J. Res. 50(2):131-145.

Describes a 1972-1973 study of recreational use on the Upper Iowa River. Canoeing, camping, fishing, and trapping activities were recorded and each were found to occur in distinct areas of the River (i.e., canoeing did not occur where trapping was popular). Canoeists and campers used the River more than fishermen or trappers. More than half of the canoeing and camping was on weekends and holidays.

238. Shafer, Elwood L., Jr., John F. Hamilton, Jr., and Elizabeth A. Schmidt. 1969. Natural landscape preferences: a predictive model. J. Leisure Res. 1(1):1-19.

People visiting the Adirondack's of New York State were interviewed during the summer of 1967 to identify significant quantitative variables in photographs that relate to public preferences for landscapes. Using factor analysis and multiple regression techniques, an equation was developed that accounts for the majority of variation in preference scores of landscape photos. Both the applicability of the model to resource planning and management and its limitations are discussed. Method has possible application for identifying riverscape characteristics preferred by recreation users.

239. Shaffer, Ron E., and Stephen F. McCool. 1973. Who's tubing down the Apple? Tech. Rep. 4, 31 p. Univ. Wisconsin, River Falls, Wisconsin.

Reports on the socio-economic characteristics of persons using innertubes to float the Apple River in west-central Wisconsin during 1971-1972. In 1971 social profiles and user attitudes were identified; in 1972 the economic impact of floaters on the local community was examined. Discusses interest of weekend and weekday users for more lodging and eating facilities in the immediate area. But found floaters contributed little revenue to the local economy.

240. Shelby, Bo. 1975. Social-psychological effects of motorized travel in wild areas: the case of river trips in the Grand Canyon. 66 p. Human Ecol. Res. Serv., Inc., Boulder, Colorado.

Reports results of two studies to evaluate potential motor/oar conflicts on the Colorado River through Grand Canyon National Park, Arizona: a pilot study in 1974 and a field study in 1975. Data from visitors traveling both by motor and oar power indicated that trip experiences differ on a number of characteristics including participant's background, opinions about motorized watercraft, number of encounters with other parties, and camping styles. Combination motor and oar powered trips were developed to observe same group behavior in both situations and to identify individuals preferences for one type of trip or the other. Floaters on combined motor and oar powered trips expressed a preference for the oar trip.

241. Shelby, Byron B. 1976. Social psychological effects of crowding in wilderness; the case of river trips in the Grand Canyon. Ph.D. diss. Dep. Sociol., Univ. Colorado, Boulder, Colorado. 180 p.

The effects of different use levels on crowding are discussed based on data collected on river trips in the Grand Canyon. The carrying capacity model traditionally applied to wilderness recreation is outlined, and then compared to a more general crowding model derived from research in other areas. Use levels have a pervasive effect on intergroup contacts, which in many ways define the "character" of the river experience. However, neither use levels nor contacts affect perception of crowding, and none of these variables affect passengers overall rating of the trip.

242. Shelby, Bo, and Joyce McCarl Nielsen. 1976. Design and method of the sociological research in the Grand Canyon. River Contract Study Final Rep. Part I, 32 p. Human Ecol. Res. Serv., Inc., Boulder, Colorado.

A pilot study of 11 trips was conducted during the 1974 river running season on the Colorado River through Grand Canyon. Final data was collected during the 1975 season by a stratified random sample of 46 commercial trips (39 motor and 7 oar) and 7 private trips. Four self-selected motor-oar combination trips provided additional data. Information sources included Park Service use records, trip reports by observers, and questionnaires and interviews from passengers and boatmen.

243. Shelby, Bo, and Joyce McCarl Nielsen. 1976. Motors and oars in the Grand Canyon. River Contract Study Final Rep. Part II, 42 p. Human Ecol. Res. Serv., Inc., Boulder, Colorado.

The effects of motor and oar trips in the Grand Canyon are discussed. Brief history of the controversy over motorized river travel is presented. Data on motor-oar differences come from two sources: people who were on either a motor or oar powered trip and people who were on a combination motor and oar powered trip. Combination trip passengers reported a clear preference for the oar trip. Implications for management are that (1) oar travel appears more compatible with the wilderness experience, and (2) a major increase in the proportion of oar travel would cause a number of changes in the river running scene.

244. Shelby, Bo, and Joyce McCarl Nielsen. 1976. Use levels and crowding in the Grand Canyon. River Contract Study Final Rep. Part III, 51 p. Human Ecol. Res. Serv., Inc., Boulder, Colorado.

Use levels affect the character of the river experience. Most river travelers define the Canyon and their trip as wilderness, and most perceive the Canyon as uncrowded. However, perception of crowding is independent of actual contact levels, and user satisfaction is unrelated to either perceived crowding or number of encounters. The lack of relation among these variables is attributed to the lack of agreement about how crowded the Canyon should be. Trip satisfaction was based on personal benefits, social atmosphere, and wilderness character the trip provided. Suggests that effective management of crowding should emphasize controlling the character of the river experience.

245. Shelby, Bo, and Joyce McCarl Nielsen. 1976. Private and commercial trips in the Grand Canyon. River Contract Study Final Rep. Part IV, 30 p. Human Ecol. Res. Serv., Inc., Boulder, Colorado.

Discusses the history of the private-commercial river trip controversy and summarizes arguments on both sides. Private and commercial users differ on a number of background variables and trips differ on structural characteristics. As a whole, the attitudes and perceptions of private users differ from those of commercial users, but are similar to those of commercial passengers taking oar-powered trips. Implications for management are discussed.

246. Shew, Richard L., and Michael P. Werner. 1976. Recreation use patterns and user attitudes on the Snake River. Final Tech. Rep., 114 p. Water Res. Cent., Washington State Univ., Pullman, Washington.

During the summer of 1971 mail-back questionnaires concerning the changes a proposed dam would have on recreational activities in the area were distributed to a sample of recreation users on the Snake River, Washington. Data showed that nearly all of the recreationists lived within 2 hours driving time from the River and that the River was their primary destination. Users were predominantly young to middle-aged and well-educated. The most popular recreation activities were sightseeing, fishing, hunting, picnicking, swimming, and relaxing. Most users felt present recreation opportunities were fair to excellent and that the dam would decrease the number and kinds of recreational activities available and cause overdevelopment of the area.

247. Sohn, Arnold J., and Arnold O. Haugen. 1969. How do Iowans use their lakes for recreation? Iowa Farm Sci. 23(9):8-9.

Studied competitive recreational uses on the Clear, Spirit, Okoboji, and Little Wall Lakes in Iowa during 1966-1967. Used pneumatic car counters, questionnaires, and time-lapse photography to describe recreational activity cycles on the lakes. Determined present and future areas of user conflict. Made the following recommendations to managers: limit boat size, zone lake areas by types of recreational uses, and manage waterfowl.

248. Solomon, Michael J., and Edward A. Hansen. 1972. Canoeists suggestions for stream management in the Manistee National Forest of Michigan. USDA For. Serv. Res. Pap. NC-77, 10 p. North Cent. For. Exp. Stn., St. Paul, Minnesota.

A survey of canoe use and opinions of canoeists on management practices along the Pine River in northwest Michigan was conducted in 1971. Users favored natural settings but did not object to the presence of streambank erosion. Also, canoeists viewed litter and crowding problems, but felt present levels of use on weekends and holidays were acceptable.

249. Stankey, George H. 1974. Criteria for the determination of recreational carrying capacity in the Colorado River Basin. *In* Environmental management in the Colorado River Basin. p. 82-101. A. Berry Crawford and Dean F. Peterson, eds. Utah State Univ. Press, Logan, Utah.

States that the Colorado River Basin offers a variety of recreational opportunities and, as such, can satisfy a wide range of user preferences and needs. All agencies responsible for managing and planning recreational use in the Basin and the public must be involved in determining the recreational carrying capacity of the Basin. Not only will their concerted efforts enhance existing opportunities but they will also open the door for new recreational pursuits. Presently the recreational planning efforts of various agencies have been isolated from each other, and the goals and objectives of these efforts frequently reflect the agencies biases.

250. Tarbet, Don, George H. Moeller, and Keven T. McLoughlin. 1977. Attitudes of Salmon River users toward management of Wild and Scenic Rivers. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 365-371. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Salmon River floaters were asked to answer a questionnaire that solicited their attitudes toward wilderness river recreation experiences and management. Factors relating to health and physical fitness, adventure, awareness of nature, communion with nature, and wilderness preservation were viewed favorably by nearly all respondents. Intensive management practices such as developed campsites, gravel roads and trails, picnic tables, garbage cans, and allowing power boats were rejected by almost all respondents.

251. U.S. Army Engineer District, Sacramento, California. 1976. Analysis of supply and demand of urban oriented nonreservoir recreation. IWR Res. Rep. 76-R2, 46 p. Appendix Inst. Water Resour., Fort Belvoir, Virginia.

Presents the results of research into the supply and demand of urban oriented nonreservoir recreation. Provides a detailed account of the data base used, the methods of collecting the data, and the analytical procedures followed in developing various recreation use prediction models. Recommends that the methods described be tested elsewhere, evaluated, and developed into a standardized procedure for use by the U.S. Army Corps of Engineers.

252. Van Doren, Carlton S., and Barry Lentnek. 1969. Activity specialization among Ohio's recreation boaters. J. Leisure Res. 1(4):296-315.

Participation in water oriented recreation is often characterized by strong activity preferences. More than two-thirds of a sample of recreational boaters in Ohio during 1966 specialized in either sailing, water skiing, pleasure cruising, or fishing (a fifth group was defined as nonspecialized). An analytical model is developed to identify the characteristics that differentiate boat activity specialists. Use of the model could have application to the study of rivers.

253. Warbler, Donald S., and Alan Jubenville. 1975. Perceptions and management preferences of users as a result of the commercial floating experience on the Snake River within Grand Teton National Park, 1975. 34 p. Dep. Recreation and Park Admin. Univ. Wyoming. Laramie, Wyoming.

Describes results of a study on individuals participating in commercial float trips on the Snake River in Grand Teton National Park. Regression analyses were used to identify independent variables that affect user satisfaction (seeing other rafts, man-made developments, interpretive talks, wildlife, etc.). Visitor satisfaction was high with respect to natural scenery, interpretive talks, wildlife, floating scenic waters, and relaxing on the trip. Seeing other rafts and crowding were somewhat neutral. Seeing man-made developments was a negative factor.

254. Welton, Brad, and Dick Harlow. 1973. California B.L.M. white-water use study. 72 p. USDI Bur. Land Manage. Folsom Dist., Folsom, California.

Summarizes the summer 1973 study on volume and use on the Stanislaus River in northern California. Also covers recreational use data collected for Mokelumne, Consumnes, South Fork of American, Merced, and Tuolumne Rivers. Contains information on the Stanislaus River about hazards, congestion at access and special interest points along the river, camping and picnicking sites, water quality, firewood availability, sanitation facilities, and types and volume of whitewater recreation use. Concludes that increased use of the Stanislaus has caused lowered water quality and serious crowding problems. Also includes information on the volume of recreational use the Mokelumne, Consumnes, Merced, Tuolumne, and South Fork of the American Rivers received.

MANAGEMENT OF RIVER RESOURCES

(Also see reference numbers 14, 18, 21, 23, 26, 27, 28, 39, 42, 44, 53, 55, 73, 84, 86, 96, 101, 117, 121, 128, 138, 142, 149, 152, 157, 158, 161, 162, 164, 167, 171, 174, 183, 185, 186, 190, 197, 201, 204, 205, 206, 207, 208, 210, 212, 213, 214, 215, 219, 221, 223, 225, 228, 230, 231, 232, 233, 234, 235, 236, 241, 243, 244, 245, 247, 248, 249, 250)

255. Allagash River Authority. 1965. The Allagash--Maine's counter proposal. Am. For. 71(2):26-29.

Summarizes a plan for State control of the Allagash River. Objectives of the plan are to outlaw the use of motors on boats and canoes, limit the use of aircraft in the area, restrict the size and location of campsites, confine timber harvesting operations to an area 300 feet from the river bank, forbid new public access roads within the waterway, and restore historical sites along the River for recreational use.

256. Chilman, Kenneth C., Leo F. Marnell, and Randall R. Pope. 1977. Developing a research capacity in field organizations to aid in management decisionmaking. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 163-167. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Discusses: (1) the trend toward developing research capacities in field organizations of national parks, recreation areas, or wildlife refuges; (2) factors that seem to be important in making such a research capacity most useful; and (3) some implications for education in recreational management and planning. Gives a detailed case history of the development of a river research program in one field location--the Ozark National Scenic Riverways in Missouri.

257. Gilbert, C. Gorman, George L. Peterson, and David W. Lime. 1972. Toward a model of travel behavior in the Boundary Waters Canoe Area. Environ. and Behav. 4(2): 131-157.

Focuses on the general overuse problem that exists in Minnesota's Boundary Waters Canoe Area and stresses the importance of determining social and ecological carrying capacities to prevent negative impacts of overuse. Proposes that once capacities are recommended, a predictive model can be used to evaluate the impacts of alternative use control measures. Identifies possible regulatory and manipulative use control techniques. Suggests Markov renewal theory as a promising tool to predict user distributions in dispersed recreation areas.

258. Harrison, Anne. 1977. Getting your story across--interpreting the river resource. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 125-138. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Suggests interpretation has special needs as it relates to river systems. These are discussed in light of the opportunities and problems associated with different sites, audiences, messages, and media. The appropriateness of media to river classifications is emphasized. Examples of interpretive services are used to illustrate the principle points of the discussion.

259. Hendrickson, G. E., and C. J. Doonan. 1972. Hydrology and recreation on the cold-water rivers of Michigan's southern peninsula. Geol. Surv. Water Inf. Rep. 3, 83 p. Lansing, Michigan.

Recreational values (e.g., trout fishing, boating, camping) of rivers are dependent on streamflow characteristics, water quality, and character of channel, bed, and banks. Generally, recreational value is enhanced by a relatively uniform streamflow. Suggests techniques such as preserving streamside vegetation to maintain water temperatures, controlling disposal of heated water to streams, and maintaining stream flow during drought periods, to manage streams for recreational values.

260. Jaakson, Reiner. 1971. Zoning to regulate on-water recreation. Land Econ. 47(4): 382-388.

Proposes a zoning system based on grouping those activities that exhibit similar density requirements and speed characteristics. Defines three activity zones: (1) a Shoreline Activity Zone, (2) an Open Water Zone, and (3) a Wildlife Zone. Guidelines for implementing the system are noted as are some of the legal, administrative, and ecological constraints that will necessitate certain alterations in the application of the model to different water bodies.

261. Kuska, James J. 1977. Biological approach to river planning and management. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 296-303. North Cent. For. Exp. Stn., St. Paul, Minnesota.

The intent of Wild River legislation was to protect certain rivers for the benefit and enjoyment of present and future generations. Suggests that to accomplish this goal, river developers and managers must consider: (1) a riverway's ordered nature and inherent limitations; (2) which specific environments (soils, vegetation) and related variables (aspect, slope) along the river are best able to absorb recreational use; and (3) how much modification (vegetation and soil degradation) of a particular environment to accept before use is altered or limited.

262. Lewis, J. Harry. 1977. TVA's role in river-oriented recreation. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 139-141. North Cent. For. Exp. Stn., St. Paul, Minnesota.

The Tennessee Valley Authority, in cooperation with other agencies and organizations, has surveyed a number of streams, acquired public access, developed parking and recreational facilities, prepared descriptive brochures, rated canoeing difficulty, and regulated streamflows from its dams. Suggests that providing use, not restricting it, is the agency's present course.

263. Lime, David W. 1969. Wilderness-like recreation opportunities adjacent to the Boundary Waters Canoe Area. Naturalist 20(1):36-41.

Suggests there are numerous wilderness-like recreation opportunities adjacent to Minnesota's Boundary Waters Canoe Area in the remainder of the Superior National Forest. If these opportunities were made known to potential recreation campers to northeastern Minnesota, demand and overuse in some portions of the Area could be substantially lessened. Notes the implications of these findings to water-based recreation management generally. Discusses some of the kinds of information needed to help recreation users choose among alternative areas and sites within areas.

264. Lime, David W., and George H. Stankey. 1971. Carrying capacity: maintaining outdoor recreation quality. *In* Forest Recreation Symp. Proc. p. 174-184. Northeast For. Exp. Stn., Upper Darby, Pennsylvania.

Discusses (a) what is meant by the concept of recreational carrying capacity, (b) what is known about capacities in terms of both how resources and experiences of visitors are affected by recreational use, and (c) what alternative procedures the administrator can use to manage both resources and visitors for capacity.

265. Mak, Kenneth R., Marvin O. Jensen, and Thomas L. Hartman. 1977. Management response to growing pressures in western white-water rivers--the art of the possible. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 102-109. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Describes agency responses to the increasing demand for whitewater recreation, development of management plans, and why planning and public involvement are needed. An example of conflicting interests and resulting political pressure is given.

266. Marnell, Leo F. 1977. Methods for counting river recreation users. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 77-82. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Recreation users on the Nation's rivers should be counted and classified. Procedures for documenting river use are reviewed and the merits and limitations of various approaches are discussed.

267. McCool, Stephen F., David W. Lime, and Dorothy H. Anderson. 1977. Simulation modeling as a tool for managing river recreation. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 304-311. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Accelerating use of free-flowing rivers for recreational floating has led many managers to set visitor use limits. The Wilderness Area Simulation Model was modified to predict patterns of river recreation use occurring under a variety of use conditions and was tested on the Green and Yampa Rivers in Dinosaur National Monument for the week of June 23-29, 1975. The "Base Case" simulation and actual patterns of use were compared and were found to be in close agreement. A variety of experiments, such as changing daily entry rates and opening and closing campgrounds, were simulated.

268. Peterson, George L., James S. deBettencourt, and Pai Kang Wang. 1977. A Markov-based linear programming model of travel in the Boundary Waters Canoe Area. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 342-350. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Describes and illustrates a Markov-based linear programming method used for predicting and analyzing travel in Minnesota's Boundary Waters Canoe Area so management can control the rate of entry of travellers into the Area.

269. Pfister, Robert E., and Robert E. Frenkel. 1975. The concept of carrying capacity: its application for management of Oregon's scenic waterway system. Rogue River Study Rep. 2, 50 p. Oregon State Marine Board and Water Resour. Res. Inst., Oregon State Univ., Corvallis, Oregon.

Increased recreational use of rivers has led to the examination of the carrying capacity concept and its management application as a basis to determine appropriate levels of seasonal use on Oregon's rivers. Proposes a set of principles based on the idea that an operational approach to carrying capacity is important in decision-making. States that although river management plans are not mandatory to implement the carrying capacity concept, they provide for a positive approach to river management.

270. Priesnitz, Michael. 1976. Minnesota's river program. Environmental Comment, June 1976. (A publication of the Urban Land Institute) p. 5-9.

Reviews provisions of Minnesota's Wild and Scenic Rivers Act. Discusses ways to preserve rivers through zoning and scenic easements. Notes the importance of effective communication with the public and the involvement of the public in carrying out program objectives.

271. Priesnitz, Michael F., and James Harrison. 1977. Managing corridors in multiple ownership. *In* River recreation management and research Symp. Proc. USDA For. Serv. Gen. Tech. Rep. NC-28, p. 183-186. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Planning and management techniques for river corridors in multiple ownerships are described. The Lower St. Croix National Scenic Riverway between Minnesota and Wisconsin is used as an example.

272. Romesburg, H. Charles. 1974. Scheduling models for wilderness recreation. J. Environ. Manage. 4(2):159-177.

Scheduling recreation in wilderness areas is explored through mathematical modeling. A river system for recreational float trips is used as a hypothetical example.

273. Shane, Richard M. 1974. Riverine recreational development; mathematical modeling: final report. R74-6, 109 p. Dep. Civil Eng., Carnegie Inst. Tech., Carnegie-Mellon Univ., Pittsburgh, Pennsylvania.

Using a computer simulation model of water quality factors, a method was developed for assessing alternative urban riverine sites for recreation. The model gives statistical summaries of simulated water quality that can reflect changes in adjacent land use patterns and socio-economic characteristics of the landowners. Other modeling techniques used to estimate urban recreational use are also discussed. Evaluates the recreational potential for noncontact activities on the Allegheny River through Pittsburgh.

274. Sohn, Arnold J. 1968. Time-lapse movie camera for recording recreation activity cycles. Iowa Acad. Sci. 75:184-189.

Reports on the use of an 8-mm time-lapse movie camera to record information on daily, weekly, and seasonal patterns of recreational activities (e.g., waterskiing, fishing, boating, swimming) on Iowa lakes. Counting boats and identifying boat types was easiest when the camera was equipped with a zoom lens rather than a wide angle lens.

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Identifies the environmental resources on the St. Croix River in Wisconsin and Minnesota that are worthy of preservation/restoration, and suggests methods to optimize management of the resources. Evaluates type and density of recreational use in the area and relates it to present facilities and management goals. To increase the tax base of the area, the private sector is encouraged to develop support facilities compatible with wild and scenic river status.

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Supplements the initial report. Contains information on shoreline controls, existing and proposed recreation facilities in the St. Croix-Namekagon area, and physical characteristics of the area.

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Investigates the scientific and historical value of antiquities in the Salmon River Canyon. The Canyon shows evidence of a lengthy intercultural period and a rich history of man-environment relations. Discusses archeologically significant finds within the Canyon; past archeological research; funding problems; and time commitments required in archeological research. Has implications for interpretive management.

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Reviews origins of legislation that led to passage of the Rivers Act and formation of the National Wild and Scenic Rivers System. Discusses the importance of acquiring lands along the river to provide a protective river corridor. Also reviews management guidelines established to protect rivers.

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Briefly describes the scenic and recreational attributes of the Chattahoochee River in the Atlanta metropolitan area. Discusses the combined efforts of local citizens and officials, State agencies, and Federal bureaus in aquiring land to preserve the Chattahoochee and its corridor.

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Describes efforts by the Forest Service to limit float-trip use since 1972 on the Middle Fork of the Salmon River, Idaho. Notes the problems of finding equitable means of allocating permits between commercial and noncommercial parties and dealing with people without reservations.

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Describes the evolution of the Interagency Whitewater Committee in the West, its present functions, and the potential of such agency coordination for the future (in the East and the West). Emphasizes the need for considering a regional approach to river management.

FEDERAL WILD AND SCENIC RIVERS LEGISLATION

(Also see reference numbers 7, 8, 10, 22, 47, 49, 50, 52, 57, 60, 61, 62, 63, 64, 67, 278)

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Legislative history: Senate Bill 119, Senate Report 90-491, House Report 90-1623, Conference Report 90-1917.

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286. U.S. House of Representatives, Committee on Interior and Insular Affairs. 1969. Wolf National Scenic Riverway. 91st Congr. 1st. sess., House Document 91-166. 3 p.

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Legislative history: Senate Bill 1928, Senate Report 92-1279, House Report 92-1579.

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298. U.S. House of Representatives, Committee on Interior and Insular Affairs. 1973. Recommending the addition of the Little Miami River, Ohio, to the National Wild and Scenic Rivers System. 93rd Congr. 1st. sess., House Document 93-184. 103 p.

299. Miscellaneous amendments pertaining to Wild and Scenic Rivers--never enacted into public law. 1973.

Legislative history: House Report 93-621, Senate Report 93-401.

300. U.S. Congress, Committee on Interior and Insular Affairs. 1974. An Act to amend the Wild and Scenic Rivers Act by designating the Chattooga River, North Carolina, South Carolina and Georgia as a component of the National Wild and Scenic Rivers System, and for other purposes. (88 Stat. 122) 93rd Congr. 2nd. sess., P.L. 93-279. 2 p.

Legislative history: House Bill 9492, House Report 93-675, Senate Report 93-738.

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Legislative history: Senate Bill 322, Senate Report 94-153, House Report 94-607.

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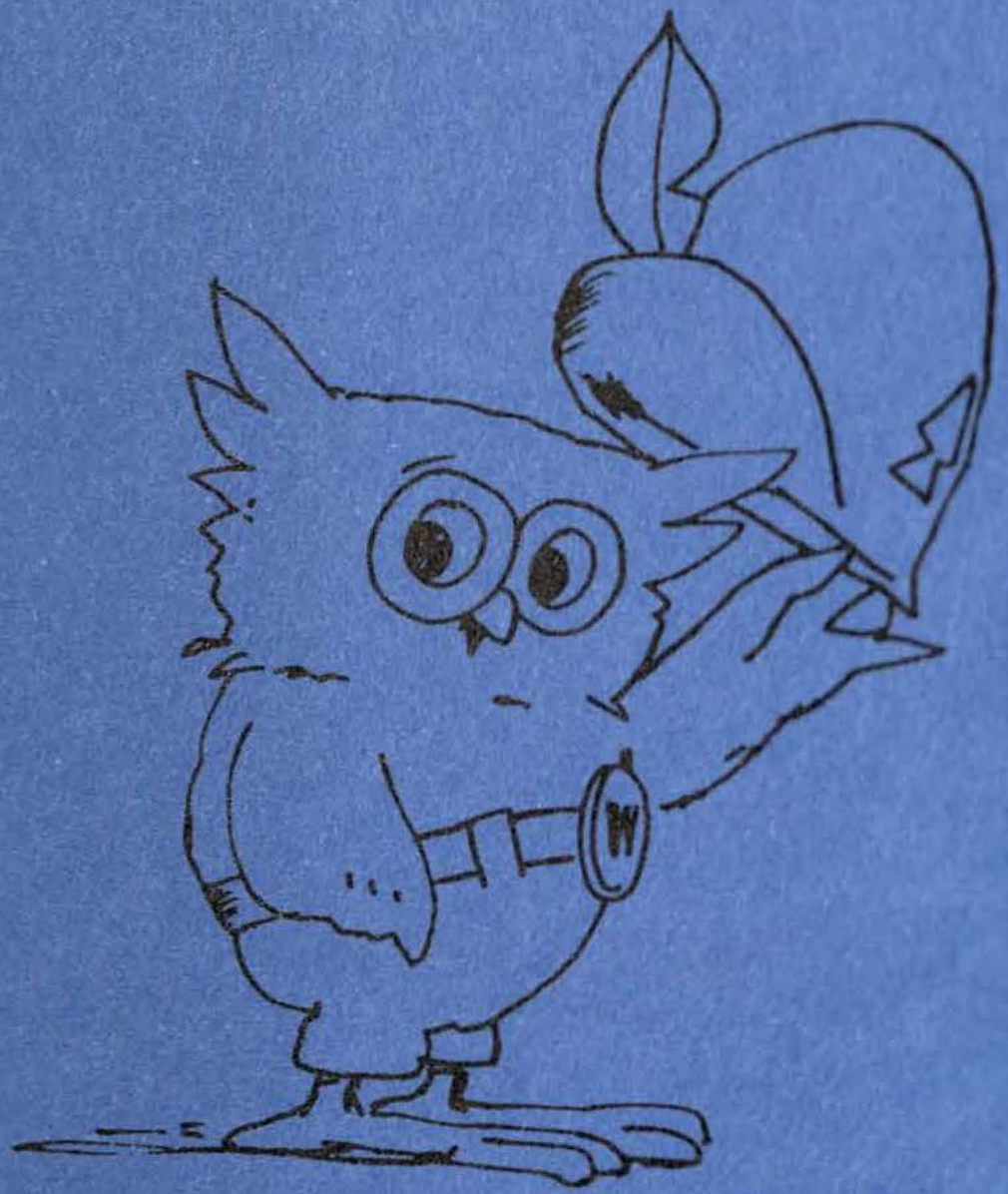

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